Vol. 104 No. 2598 THURSDAY MAR 8 1951 9d.

THE MODEL ENGINEER

The MODEL ENGINEER

PERCIVAL MARSHALL & CO. LTD. 23, GREAT QUEEN ST., LONDON, W.C.2.

8TH MARCH 1951 VOL. 104 NO. 2598

SMOKE RINGS

Our Cover Picture

● THE SUBJECT of our illustration this week is the model of a North Sea steam drifter which won the Steamship Championship Cup in last year's "M.E." Exhibition. It was made by Mr. H. G. Ross, of Wallington, Surrey, and is a beautiful example of the shipmodeller's art; no spit and polish, but just a good, honest, straightforward representation of a working ship. The hull is built of metal, plated on a keel and frames, with the plates and strakes accurately scaled. The lines are faithfully reproduced and, although not seen very well in the photograph, the counter, and the easy run of the lines along the quarters are very well shown. The power plant is a single-cylinder slide-valve engine with a water-tube boiler fired by a paraffin blowlamp. The deck fittings are worked out in considerable detail, and we understand Mr. Ross made more than one trip to Lowestoft to see the prototype and to get everything correct. The drifter and the trawler make ideal prototypes for working models, as if these are made to a reasonable size the scale is large enough to enable the modeller to show practically all the details and fittings. The depth of hull and the beam-to-length ratio are suitable for a sailing model and need little, if any, adjustment for the sake of the stability and seaworthiness of the model. Further, the displacement of a 40-in. to 50-in. model of this type is from 30 lb. to 45 lb., which is ample for an effective power plant.

The Glasgow S.M.E. Track

● WE WERE glad to receive recently a chatty letter from Mr. Allan Rodger, hon. secretary of the Glasgow Society of Model Engineers. It is some time since we received a direct personal letter from the society, and we note with much interest that the locomotive running track at Rutherglen is now 780 ft. of continuous circuit. An official opening ceremony will take place later in the year. Construction of the track was started as long as twelve years ago, and has since been hampered by a number of unforeseen delays and difficulties; but perseverance on the part of a group of enthusiastic members has been rewarded by success, at last. At present, there are eight locomotives building in the society's workshops, and it is hoped that some of these will be ready for the official opening of the track.

The "locomotive" section intend that one of the functions of the new track shall be to provide data to enable a study to be made of the effect that various detail dimensions and features of design have on the performance of small steam locomotives; in other words, the track will be used, from time to time, to supplement a test stand. In this way, there is a likelihood of much useful technical information coming to light; if it does, and if it can be co-ordinated with similar information obtained from other societies, a good deal of interest will be added to the miniature locomotive hobby.

Incidentally, the Glasgow S.M.E. attained its

30th anniversary in January; we offer our congratulations and our best wishes for continued success and prosperity. Its founder, Mr. D. Young, is still a member and has held successively, the offices of secretary, treasurer and president.

The Chichester Exhibition, 1951

● THE FINE "Festival Year" exhibition organised by the Chichester and District Society of Model Engineers was opened by Sir Alliott Verdon-Roe, O.B.E., in the presence of a distinguished company. The society had spared no pains to ensure success, and had been ably supported by the Southern Federation, the Northern Association and societies as far afield as Hull, Grimsby, Manchester and even Glasgow. The result was a thoroughly representative show covering every phase of our hobby and it did ample credit to all concerned.

About 450 separate exhibits were on view, neatly and conveniently arranged; in this respect the hall at the assembly rooms is admirably suited to the purpose, since it is not too big and thereby preserves a delightfully intimate atmosphere. There is, however, no space available for a passenger-carrying track, but an attractive "O"-gauge model railway was operating successfully in one part of the hall.

To Traction Engine Enthusiasts

● WE HAVE received a note from Mr. E. J. Baughen putting forward a strong plea that traction engine enthusiasts should arrange a grand rally and demonstration at the "M.E." Exhibition this year. He recalls that the working traction engines created so much interest at the 1948 exhibition that he is sure that they would again this year, especially as so many visitors from overseas will probably be in London at the time.

We must say that we like the idea, and we hope that, when the arrangements for the exhibition are completed they will include some floor space where the miniature traction engines can be demonstrated under steam.

In any event, we hope that there will be more tractions at this year's show than there were last year; we know that there are several being built.

Utilitarian Workshops

● ALMOST EVERY day we hear of some model engineer who is using his workshop for the construction of utilitarian implements of one sort or another. At first, we are likely to look askance at this deviation from the proverbial "straight and narrow"; but upon reflection, it becomes obvious that, not only are these worthies benefiting from the additional variety of domestic and allied forethought, but they are also establishing the fact that the model engineer's workshop is indeed capable of handling all manner of utility jobs with perfect efficiency.

To some readers, this might appear to be a superfluous statement, but there are many readers as yet unaware of the tremendous scope of the tools at their disposal. There are few better methods of self-education than to turn one's hand to one or other of the many little jobs around both home and workshop which, for want of very little imagination and improvisation, so often remain neglected. It is often found, too, that in thinking out a solution to a thorny household problem, one suddenly comes upon an answer to a modelling problem which might easily have remained unsolved.

We are always very pleased to hear from readers who have been able to turn their workshops to good use in repairing, elaborating or improving their domestic amenities, always provided that their activities in this direction give real scope for mechanical craftsmanship, and have a bearing on the class of work in which the general reader is primarily interested.

The Other Side

● IN THE MODEL ENGINEER for December 28th last, we published, under the heading "Bad Business," a complaint we had received from an overseas reader regarding certain delinquencies of British firms. As we rather expected, we have since received further letters on the same subject, and we feel that we are justified in adding to our previous comments.

It was only because the letter we quoted was one of a number of similar complaints that had reached us during the previous months that we decided to give the matter some publicity. We had no intention of suggesting that the delinquencies complained of are usual; we know quite well that such a suggestion is not true, and we tried to make this clear in the final paragraph of the note referred to.

However, another overseas reader, in the same line of business and in the same country as our previous correspondent, has written to us as follows: "We have been in the model supply business in this country for a great many years and have been constantly buying from British firms. My experience has always been just the opposite of your writer. We find the British firms are as prompt as can be expected, are quite as businesslike and, when there will be a delay, they notify us and state the cause. Being in the model business myself, I understand the difficulties they work under and, for my part, I say they are doing a wonderful job."

There is the opposite opinion! We are glad to quote it, if only because we ourselves feel that it is more in keeping with the usual experience of overseas clients when dealing with British traders.

A Cavalcade of Brighton Transport

● MR. S. R. BOSTEL, who has been deputed to deal with publicity in connection with the Brighton and Hove Society of Model and Experimental Engineers' exhibition, due to be held from August 4th to 11th, next, informs us one of the stands will be called a "Cavalcade of Transport from London to Brighton." It is intended to display representative models and illustrations of all forms of rail and road transport which have been operated between the two places from the earliest times to the present day. If any readers know of any models, photographs or other illustrations which would be appropriate and could be loaned for the occasion, would they please communicate with Mr. Bostel, Bostel House, 8, Cranbourne Street, Brighton, 1.

MOTORISING THE MOWER

Or, perhaps, building a bobbin, because that part was far more interesting

by A. D. Stubbs

MY motor is a 1/3 h.p., 1,325 r.p.m. machine, and is really too fast for the job, but a slower motor would be heavier and, anyway, I had it.

When I have finished the grass, and the motor runs a finger under its sticky collar, the mower is housed at the business end of my lathe. The vee-belt comes off, my countershaft belt goes on, and before the motor has recovered its breath it is winding off a heavy cut from steel bar.

The mower is a Qualcast Panther, originally chain-driven from the road roller. Fig. 1 shows you the general idea, where you will see that two steel motor carriers span the mower frame. Fig. 2 gives the dimensions. The belt adjusting slots are essential in the *B* carrier, and probably ultimately useful in *A*. In practice, my belt has not stretched, and the motor is still almost horizontal.

Because the motor is a maid of all work, I have a 2 in. diameter flat-faced pulley with a $1\frac{3}{4}$ in. p.c.d. vee-groove (40 deg. included angle), for the $\frac{3}{8}$-in. vee-belt. If you are making your own pulley, Fig. 3 will give you the dimensions for the groove. I kept my mower pulley, Fig. 3, as large as possible, and have had no trouble with the mower bearings or, indeed, with any part of the whole job. The mower spindle is screwed $\frac{1}{4}$ in. B.S.P.T. so I tapped the pulley to suit, and key-wayed it on.

If anyone can tell me how to cut an internal keyway in the lathe, I shall be grateful. I have seen the cross-slide used rather brutally as the ram of a shaper, but in my case I revert to the

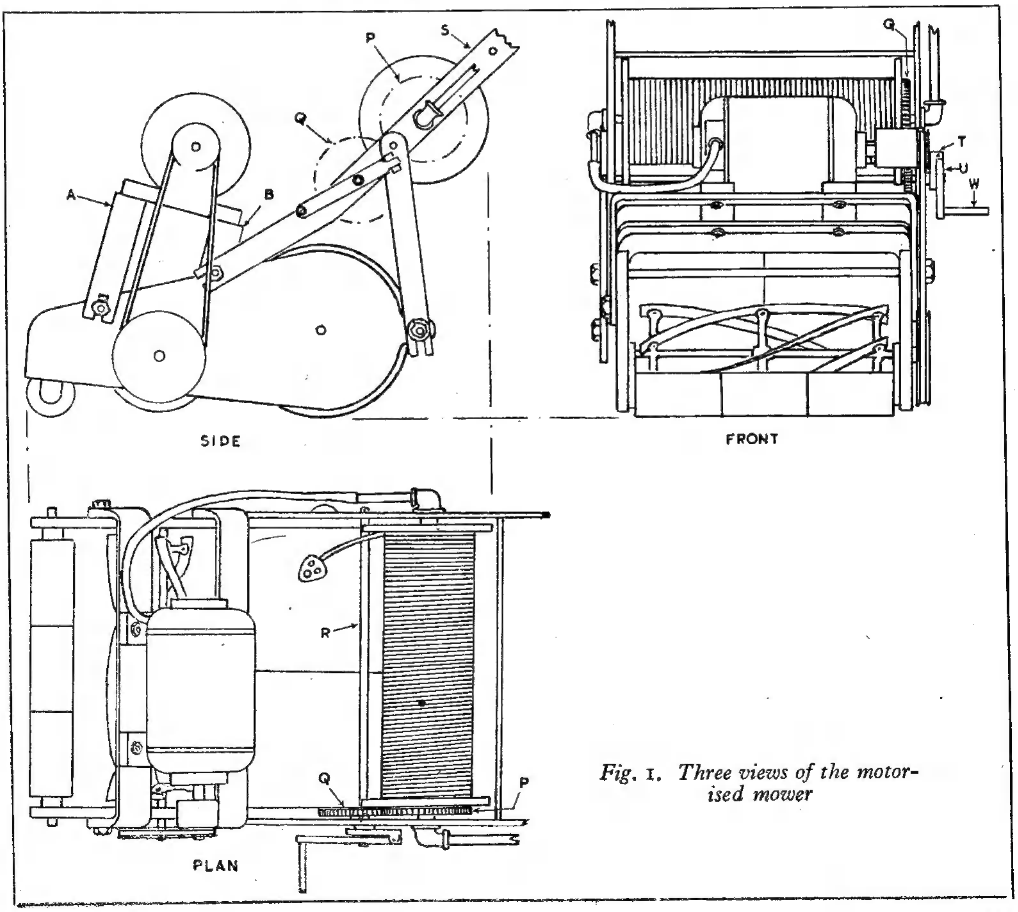


Fig. 1. Three views of the motorised mower

vice with a file. My key was originally a piece of aluminium, intended to be the "weakest link." Having sheared off several keys by mowing up clothes peg springs, a dropped nut and an odd nail, I decided that there was nothing much wrong with the job, and made a steel key, which by now has probably rusted in.

me as slip ring pick-up brushes, and also some heavy gauge ½-in. brass tube, but this had to be insulated from the central spindle. Two 3 in. lengths of garden hose, ⅝ in. bore, from the ironmonger's solved the problem, part *G*, and I used the same material as bushes within the ball journals of *C* because the dimensions were just right, and so avoided the necessity of turning up metal bushes.

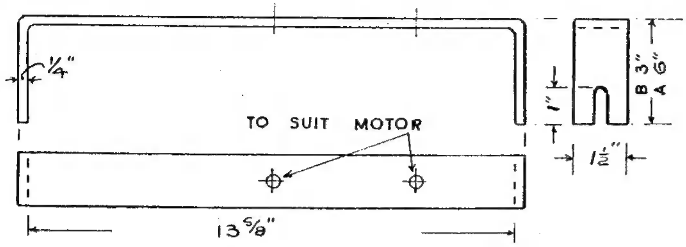


FIG. 2.

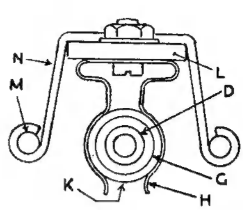


FIG. 5.

My cable drum, with 6 in. diameter flanges, carries 120 ft. of heavy three-core T.R.S. cable with ease, in fact, it need not have been more than 4 in. diameter. I had a 6 in. strip of ¼ in. pre-war three-ply, so used the full width, and in each mounted an aluminium ball-journalled vee-pulley.

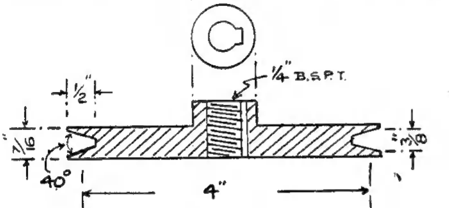


FIG. 3.

These were aircraft rudder wire pulleys once, and one side of the vee I turned off, as shown in Fig. 4, lettered *C*.

The central spindle, *D*, is 14¾ in. long overall, ⅛-in. steam tubing, screwed for 1 in. at both ends. Around the turned-off pulleys *C* is the remains of an aluminium garden fertiliser container, lettered *E*, 3 in. diameter and 12 in. wide. For effective insulation a circle of paxolin, *F*, nests inside, so if ever the aluminium does collapse, the slip rings will not be shorted.

The slip ring arrangement really grew out of the scrap box. Fig. 5 gives the details. I had three Terry spring clips, part *H*, which appealed to

My central slip ring, *J*, Fig. 4, is drilled and tapped to take a 6-B.A. set-screw, which passes through one side of the tube *D*, to give a good earth. The slip ring diameter is ¾ in. and the two external flanges ⅞ in. These prevent the spring clips, *H*, from moving laterally. The other two slip rings, *K*, are ¾ in. parallel.

A strip of ebonite, 10 in. × 1¼ in. × 3/16 in. holds the spring clips, this being shown as part *L*, Figs. 4 and 5. This in turn, although kept in position by the slip rings is fixed to two 3/16-in. steel rods, *M*, by ⅛-in. brass wire hangers, *N*. The rods cannot be seen in Fig. 4, but they are 12¾ in. long, and pass through parts *C* and the wooden flanges, are screwed at both ends, and each is fitted with four nuts to lock them up. A recess is cut in the ebonite strip, *L*, to register the hangers where they pass round what would otherwise be a sharp corner, and so the hangers cannot ride off endwise.

In the cylinder, *E*, is an end slot to accommodate my three-core cable, the ends of which are secured to the spring clips by nutted set-screws, and before you solder the wires from the outside slip rings you should decide upon the method of wiring.

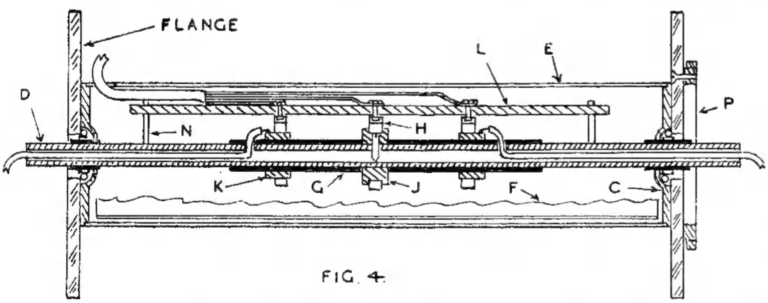


FIG. 4.

Fig. 6 shows my circuit. I had the contactor starter with the motor, and wanted to use it because it has overload releases which pull out much faster than my 5 ampere fuses and, incidentally, can be reinstated by pressing a button. Having purchased the three-core cable I had no option but to earth my neutral.

Yes, I have heard of the I.E.E. and I can tell you something else, too. When I took over my house I noticed that the neutral tail of the company's side of the company's fuse was bare for about ½ in. outside the case, so I mentioned the

fact to the engineer when I applied for a power meter. He told me, in writing, that the neutral was earthed, and that some concerns used bare wire!

Anyhow, my L1 goes via the contactor coil to my switch, thence to the mower frame and back to neutral *and earth.* This circuit only carries .1 amp. closure of the switch pulls in the contactor, which puts the motor across L1 and N, and off we go.

To use normal practice, your circuit will, of

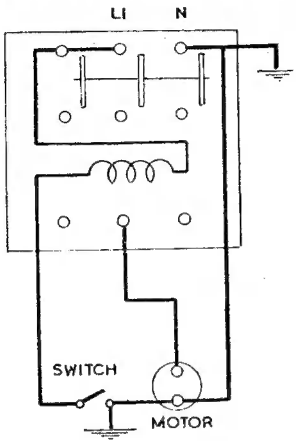


FIG. 6.

The drawback was that after cutting the grass, I had to wind up 120 ft. of cable by paddling round the cable drum. This took about two minutes, or, say, about one hour paddling time per annum. If I cut grass for another thirty years I shall be surprised, lucky or unlucky, whichever way you look at it, so the winder, Fig. 7, really saves time to the extent of only a few minutes, but it's there.

It took me many months, solely because I wanted the gear drive and could not locate a pair.

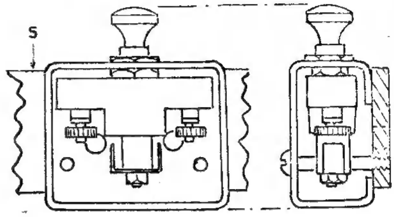


FIG. 8.

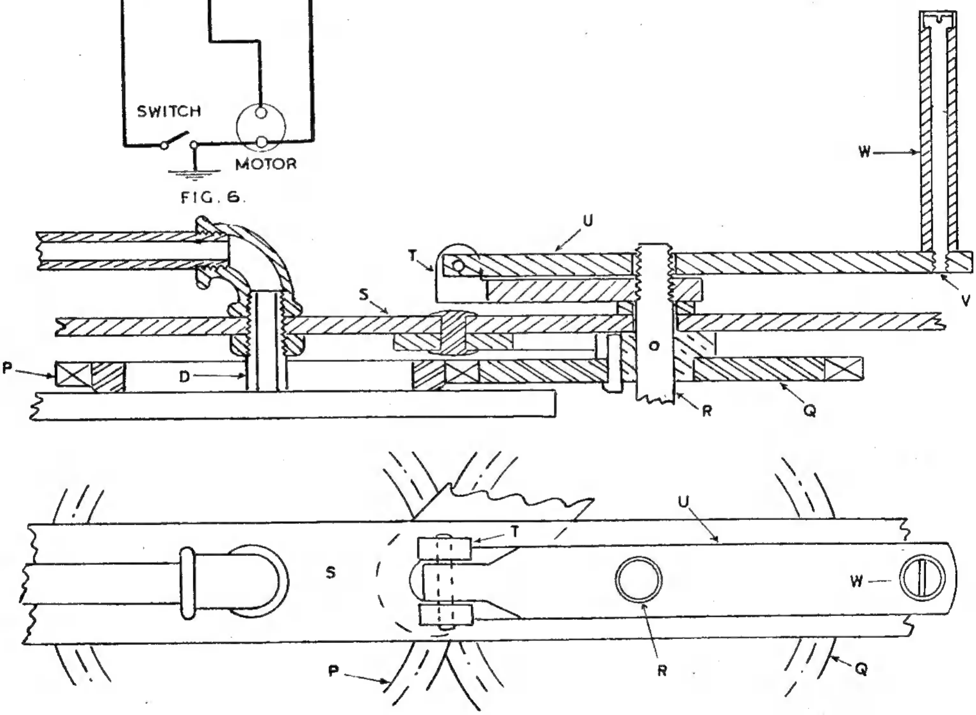


FIG. 7.

course, be line-switch : switch-motor : motor-neutral, with the third core from earth to mower frame. A three-pin socket is fixed to my distribution board beneath the starter, enabling me to disconnect quickly.

This completes the mower as originally made up. I did not want a drive to the road roller (I'm not that old) because I have to negotiate a lot of awkward corners around my roses, and did not fancy being more or less towed at high speed under or through the roses.

Finally, I acquired a single lathe change wheel, with 53 teeth (query, what are 53 teeth for?) which, being otherwise useless could fill the bill. Using a parting tool, I divided it through the teeth, and having arrived at the root, exchanged the tool for a $\frac{1}{16}$-in. hacksaw blade parting tool for another $\frac{1}{8}$ in. depth of cut. The boss and periphery of the wheel were $\frac{5}{8}$ in. thick, but the intervening thickness was only $\frac{1}{4}$ in. so I cut in on the side of the wheel to the root of my "parting tool" cut, and separated a gear ring,

half width, for assembly on the cable drum.

This is lettered *P* in Figs. 4 and 7, and is fixed by three set-screws. As I had long before completed the drum I had to shorten it to accommodate the gear ring.

The other half wheel, *Q*, Fig. 7, had to be bushed from its $\frac{3}{4}$ in. bore to the $\frac{1}{8}$ in. steam tube, *R*, which passes right through both mower arms, *S*. As the change wheel was keywayed, I keywayed the bush (easy going there), and pinned it to the shaft.

In order to avoid increasing the width of the mower, my handle had to be collapsible, particularly so by reason of my roses and hedges, two of which meet the lawn, so I copied mother's sewing machine, producing part *T* from $\frac{1}{4}$-in. steel plate. The two ears are forged up, and the centre piece cut away afterwards, to allow the crank *U*, to swivel through 180 deg., the handle then lying across the cable drum.

Handle *V* is $\frac{3}{16}$-in. steel, the end being bumped up and machined to cheese-head. The grip, *W*, is brass tube, recessed at the outer end for the cheese-headed handle.

If you wire to I.E.E. rules, you will need a tee on the right-hand side of the drum spindle instead of the elbow shown in Fig. 7, but the elbow in Fig. 1 suffices for both circuits. In either case wiring into steam fittings is a little bit tricky, but it does away with the inspection covers of conduit fittings.

Fig. 8 illustrates my contactor switch, where *S* is the mower arm, the switch being mounted against the mower handle grip. I used a Telsen radio switch from the scrap box, and housed it in a 16-gauge sheet steel box, bent up from one piece, corners rounded and soldered. Two 6-B.A. set-screws secure it to the mower arm, and a hole is drilled in the arm to admit my single wire, the other switch terminal being earthed to the 6-B.A. set-screw. I show two cable holes, for normal wiring.

And there she is. A good and faithful servant. Now I'm toying with the thought of a flexible drive, carrying a hedge trimmer, but at the moment cannot make up my mind whether it shall be reciprocating or rotary in action. What would be far, far more useful would be a weeding attachment, preferably fully automatic, but I could manage to put up with one controlled by push-button. Any ideas ?

Mains Wiring in the Smaller Workshop

THE simple form of electric wiring that I am about to describe is one that has been in use for many years with success and safety. In the small amateur workshop the main requirements include simplicity, adequate capacity, safety from unauthorised switching-on and safety from the fire hazard. As only one person is using the workshop at one time the load on the mains is not very heavy.

We start from a power point in the workshop—and we are not concerned in this article with the wiring up to that point. A socket board is constructed from dry wood, about 1 ft. square, for the components detailed below. Drill the necessary holes for wires and screws for a layout comprising (a) two "Slydlok" fuses, (b) say, five 5-amp. sockets, and (c) say, one 5-amp. switch. The design can be modified so as to include more sockets or more switches ; the figures given are the least that should be used. The board should be well varnished. Behind it a flat type of plug is fixed, flat on the board but with such packing as is necessary to allow the socket to be slid on to it, and the plug is so arranged that the cable from the power point (terminating in a flat-type socket) leads to it without undue bending at this point. As this cable will be left energised when all else is switched off, it should be a piece of the very best cable and so placed that it will not get damaged.

Each lead is fused, and the fuse wire should be slightly lower in rating than that used for the power circuit, so that the local fuses blow before the house fuses. The main room lighting will normally be on another circuit and will be available for the fuse-replacement process ! (Bench lights can well be plugged in along with other equipment.)

The use of only one switch, and of unswitched sockets for the other outlets, suits my workshop, in which the lathe has its own switch, the soldering iron, bench lights and electric fire do not need switching but can just be plugged in when required, and the bench drill alone of the main items requires a switch. Minor pieces of equipment that may need a switched plug can be used in the one that is available, for the bench drill will not be in use just then.

Good cable leads are used with each piece of equipment, and they terminate in plugs—a touch of colour may help in identification. The leads are not left lying around, but are clipped along the woodwork or walls to points near to the board.

The board should be mounted on the wall, with dry varnished spacer strips arranged to leave at least 1 in. between it and the wall, or the mounting can be modified so that the board forms a movable unit and is only fixed in a semi-permament fashion ; in my own case it is fixed by two steel pins, between two locating strips.

In plugging the main cable into the power point, it can be arranged (with the aid of a neon tester) so that the switch or switches are in the live lead. If several switches are used they should be arranged in the same side of the wiring, so that this effect can be produced. All pieces of plant will, of course, be well earthed.

In order to get the full advantage of a board of this type, it should be mounted centrally as regards the plant, but at the same time in view of the door. It then provides a simple and foolproof visual indication that all is safe when all the plugs have been removed from it. I make a point of removing them all whenever I leave the workshop, and, as an additional safeguard, I have arranged with my wife that if she ever sees a plug left in when I am not about she will pull it out. In this way only the very minimum of cable is left energised when the workshop is not in use, and no meddling fingers can possibly set machinery in motion unless they can reach and use the board.—A.T.O.

The "Drummond" Apron

by R. Thurley

MY attention was drawn to a letter in the November 2nd issue of THE MODEL ENGINEER in which Mr. Franks experienced difficulty in making up the apron conversion for the $3\frac{1}{2}$-in. Drummond lathe described by Mr. Lloyd in THE MODEL ENGINEER in July, 1943.

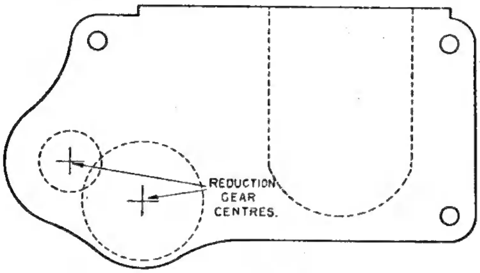
As I have had one of these conversions in constant use since first described, and was also responsible for the supply of a number of sets of gears, etc., to other readers, I feel qualified to state my experience with it and also, possibly, help Mr. Franks to get over his problems.

Dealing with his first query, I should have thought that quite a casual look at the drawing on page 89 would have been sufficient to show that the $\frac{7}{8}$ in. dimension was an error, comparison with other sizes making it quite obvious.

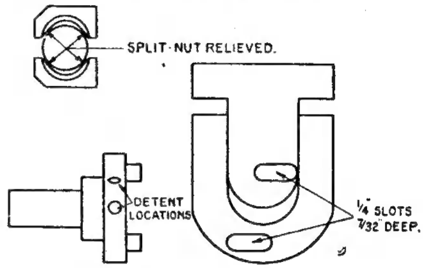
Regarding the second point raised, the $\frac{1}{4}$-in. clearance on the split-nut is sufficient, provided the half-nuts are relieved as mentioned by Mr. Lloyd and as sketched by me herewith.

I made one or two modifications to the designs, the first of which was the re-location of the hand

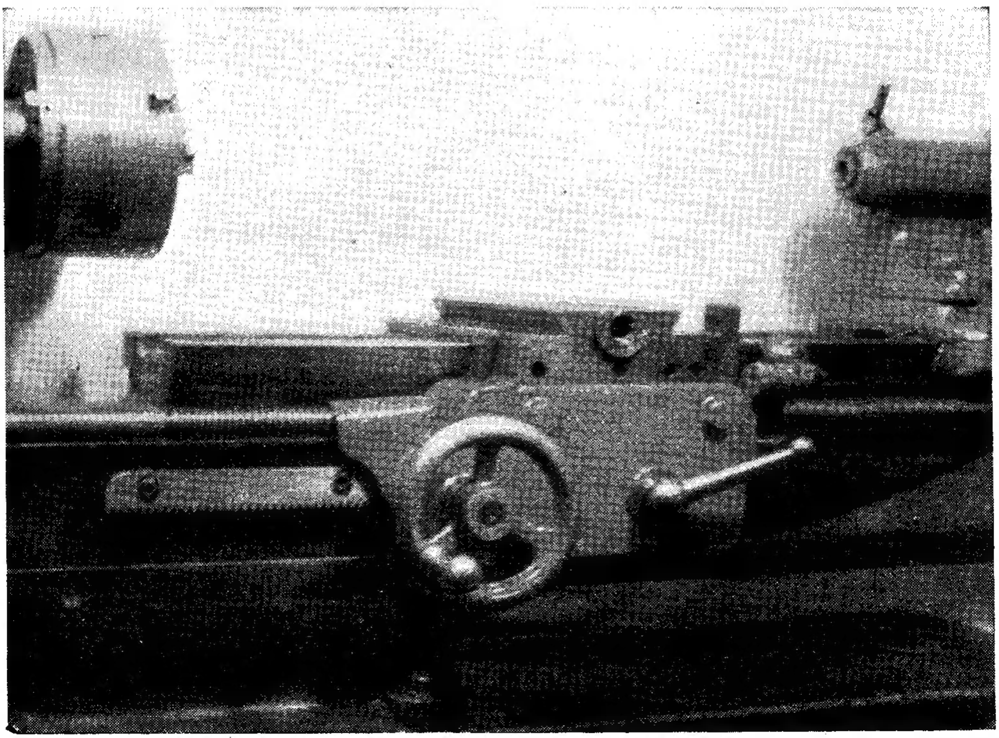
(*Continued on page* 320)



Outline of modified front plate



Split-nut slide operating shaft *Modified split-nut slides*



A Division Plate and Mandrel Lock

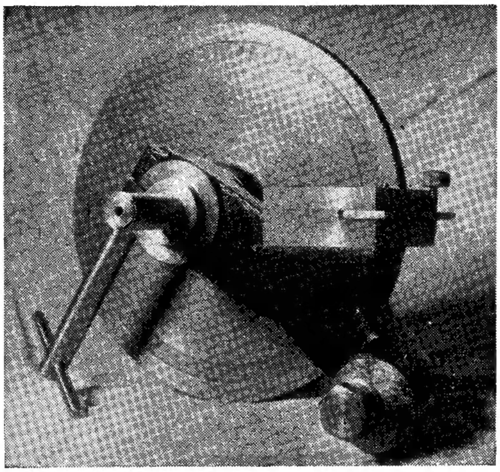
by J. Latta

OF the making of accessories for the model engineers' lathe there is no end, but I do not recollect having seen anything in the pages of THE MODEL ENGINEER quite the same as the gadget I am about to describe; and therefore it may be of interest to those who like a bit of toolmaking.

What there is of novelty applies to the locking arrangement, as old readers will recollect previous descriptions of division plates mounted in a similar manner.

When I bought my Milnes lathe in the early 'twenties, Mr. Milnes offered to fit me a bronze division plate with four rows of holes, to the front of the large gear on the mandrel; all complete with a plain spring stop, for an extra £2.

To my lasting regret I economised on this item, which I felt the need of on several occasions.



The division plate and clamp complete

However, a division plate on the mandrel with a stop of this type, although very useful for marking out and light drilling of work held in the chuck, is not really suitable for milling, as it is a little unfair to expect the very small peg of the stop to hold the mandrel against heavy cutting stresses.

Apart from dividing, some means of locking the mandrel when slotting keyways and the like is most useful; the makeshift method of putting in the back gear, and hanging a heavy weight to the side of the chuck to take up the backlash, is not an ideal way out of the difficulty.

Sometime back, having a dividing job that would be most conveniently carried out while the job was still mounted in the chuck, I though it was time to fit up a division plate, and bearing in mind the points mentioned above, I decided that it should incorporate some method of locking the mandrel at the same time.

A good division plate was to hand in the form of a 7 in. diameter mild-steel disc, notched with 360 divisions on the outer edge. This was a plate I had had made some years ago for a special job; and it took the place of the small division plate on the milling attachment. Owing to its size it could seldom be used.

The only place it could be fitted to the lathe mandrel was at the tail end, and to clear the tumbler reverse gear, it had to be mounted about 2 in. beyond the end of the mandrel.

As finally schemed out, the spindle on which the plate was mounted, was secured into the mandrel bore by a split expander, but when I examined the bore in question I did not think that it was accurate enough.

It was not noticeably out of truth, but being only a drilled hole, I felt sure that it would be all the better for being smoothed up a bit.

As I did not wish to remove the mandrel from the headstock, this presented some difficulty; but finally I decided to perch the lathe top-slide on an angle-plate which in turn was bolted to the change wheel swing-plate.

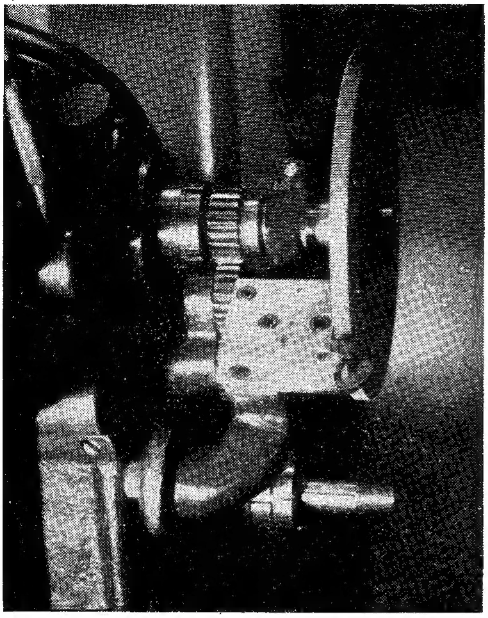
I was a bit dubious about this set-up, but these old lathes had more solid cast-iron about them than present-day makers can afford to use, and I was agreeably surprised to find that when I had set up a little boring tool in the slide, there was no difficulty about taking a light cut down the bore, and by carefully setting the slide I made it smooth and parallel to a depth of about 1½ in.

After this was completed, it did not take long to turn up the spindle for the plate and fit the conical expander and drawbolt, and I was delighted to find that the big plate ran as true as if turned in position.

The bronze expander, as first made, had an included angle of about 40° similar to the nose of the usual collet chuck, and this was done so that it would be self-releasing when the drawbolt was slackened, but I found that the bolt had to be tightened excessively to get a really firm grip. I therefore rebored the end of the plate spindle to an included angle of about 20° and made a new coned expander to suit.

This was much more satisfactory, and held firm with only a moderate pressure on the bolt. With the finer angle the taper is, of course, not self-releasing when the bolt is slackened, but a light tap with a hammer on the outer end frees it at once.

The next point is the mandrel lock. The idea here is to embrace the division plate spindle with a split clamp, which can be tightened with a hand-screw. The lower end of the clamp arm



The plate and clamp in position on the lathe

is extended and curved round to meet the change wheel swing-plate, to which it is secured by a single bolt.

When the clamp is slackened, the lathe mandrel can revolve freely, and can be positioned for dividing as required, but with the clamp tightened the mandrel is locked without strain, and without any tendency to move during the locking process.

As can be seen from the photographs, the arm also carries the spring-loaded knife-shaped latch that engages the notches in the edge of the division plate.

My original intention was to make the arm of aluminium alloy, and thus the pattern was made somewhat thick and heavy. However, after the pattern was made, I heard of a local iron foundry with a good reputation, and wishing to sample the quality of their work, I got it made in cast-iron, so that it now appears unnecessarily strong, but is not otherwise a bad fault.

The block which holds the spring latch is in two pieces, with the latch sandwiched between them, so as to simplify the making of the slot for the latch which naturally requires to be a neat fit free of any side play.

The whole is secured to a facing on the arm by three $\frac{1}{4}$-in. Allen screws and two 5/32-in. dowe pins.

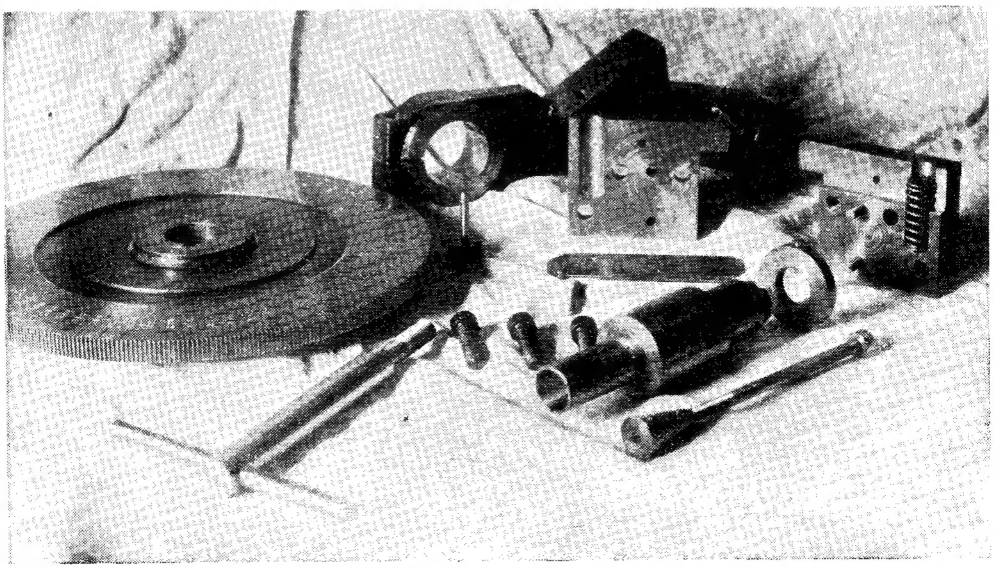
The latch pivots about mid length on a $\frac{1}{8}$-in. taper pin.

As can be seen in the photograph of the " bits and pieces," the spring which pushes up the tail of the latch is housed in a blind-ended hole bored in the two pieces of the block after they have been fitted together.

The notches in the edge of the plate are not square, but have slightly tapered sides and a radius at the root, and actually I think they were probably cut with the tip of a small gear cutter.

The part of the latch which fits the notches was carefully filed to suit, so that it fitted on the sides and was clear at the root. This portion was case-hardened locally to prevent wear.

All the machining operations were of a straight-forward character and call for no comment. The clamp was bored before splitting so as to be just a neat running fit for the spindle, and it locks very firmly with only the lightest pressure of the handscrew.

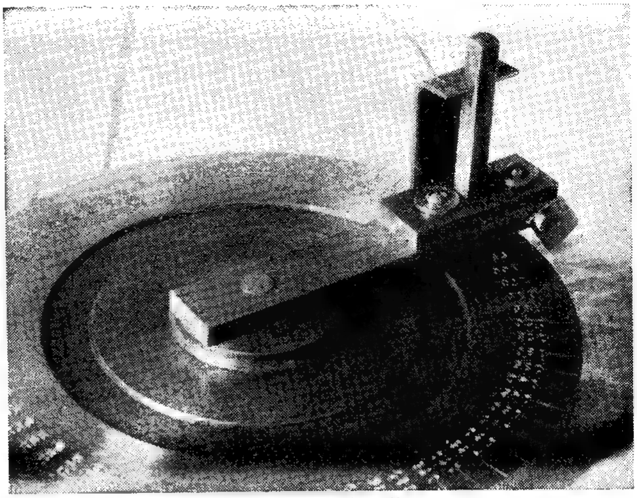


The " bits and pieces "

The face at the lower end of the curved arm where it bolts against the swing-plate required ■ little attention with a scraper before the mandrel would spin freely when unlocked; otherwise there were no particular difficulties in fitting the gadget to the lathe.

One final job remained to be done. The plate was numbered at every fifth division, and these numbers unfortunately were on the headstock side, where it ■ difficult to read them, so the plate had to be renumbered afresh on the outer side.

This meant typing almost 200 figures, and I did not feel equal to making ■ neat job of this by hand, so the simple jig shown in the photograph was made up from pieces of B.M.S. bar.



The numbering jig

The punch is guided at the lower end by ■ square hole filed in the short piece screwed to the end of the radius arm.

The upper end is steadied by ■ square notch cut in ■ piece of bent plate.

The lower guide is slotted at the screw holes so that it can be moved over to align the punch with each of the three rows of figures in turn.

A simple latch held by a cheesehead screw engages the notches on the edge of the plate and serves as an index.

Even with the aid of the jig, the numbering was a long job, and I was relieved when I completed it without any errors.

A coat of enamel on the unmachined surfaces of the arm gave ■ workmanlike look to the finished article, which I feel is a worthwhile addition to my lathe.

Finally, I thought it would be a good idea to test the accuracy of the plate and its mounting.

To check this, ■ 5-in. sine bar was bolted against the faceplate, and the relative height of the two buttons on the bar was measured with a sensitive dial gauge reading in ½-thousandths mounted on a Vernier height gauge placed on the saddle.

Taking various divisions at random round the plate, I could detect no measurable error exceeding ½ ■ thou.

Assuming the Vernier is accurate to within a thousandth of an inch, the angular error at 5 in. radius is probably not more than this amount, say, about half a min. of angle or so, an unexpectedly good result, and well within most model engineering requirements.

However, quite as important from my point of view, was the fact that when the clamp was tightened, the dial gauge did not move, showing that the mandrel could be locked without disturbing the division plate setting.

The "Drummond" Apron

(*Continued from page* 317)

wheel and the 2-to-1 reduction gear further to the left in order to give more clearance under the cross-slide. This modification is shown quite clearly in the photograph.

The second alteration was in the method of operating the split-nuts. By end-milling two slots in the "U" and "T"-shaped pieces and mounting pins in the end of the operating shaft ■ shown herewith, the actuating plate can be dispensed with. Both the "U" and "T" plates and pins actuating them are hardened and have given ■ trouble at all, the pins themselves, operating in the slots, act ■ stops, thus obviating the necessity of shaping the boss on operating lever. The locking detents are also located in the edge of the boss carrying these pins.

I also incorporated ■ phosphor-bronze block, bored ■ running fit for the leadscrew, to act ■ a guide and obviate any tendency for the leadscrew to catch up "if it is not dead true," which mine was not.

If it is not too late to offer a word of advice to Mr. Franks, I would say, check thickness of existing apron plate and also location of $\frac{5}{16}$-in. set-screw securing traverse stop, as these lathes vary slightly dimensionally.

As mentioned earlier, I have had mine in constant use, with no trouble except for renewal of half-nuts and one bush, and I can assure readers it is ■ thoroughly sound design and well worth the time taken to carry out.

THE HUMBLE FILE

by A. Smith, M.Coll.H., A.M.I.E.D.

MAN has, as is usual, borrowed freely from Nature in developing the possibility of shaping materials by abrasion or filing. The wasp, for example, possesses a rasp-like organ with which it abrades dry wood, afterwards mixing the dust with a glutinous saliva to form the paper from which it builds its hive. There is also a type of mollusc having a rough tongue, with which it rubs through the shells of other molluscs on which it feeds.

Primitive man resorted to sand, bone, stone, and fish skins as abrasive mediums. Often he would make his own stone axe by laboriously abrading it with a flat piece of granite or harder stone—patiently filing away until his implement had attained the desired shape. A large number of primitive natural files have been found in North America, and from the peculiar grooves in them it would appear that they had been used for smoothing arrow-shafts. In confirmation of this, it may be pointed out that the Eskimos still use stones to smooth and sharpen their spear heads.

It is to Asia that we must turn for the beginning of the artificial file.

At this period, *circa* 2500 B.C., while all the East shared in the knowledge of bronze, Europe was still in the Stone Age. In 1st Samuel, Ch. 13, v. 21, we read :

" . . . they had a file for the mattocks, and for the coulters, and for the forks, and for the axes, and to sharpen the goads."

A bronze file found in Crete, and now in the museum at Candia, is reputed to have been made about 1500 B.C. It bears an astonishing likeness to a half-round file of today, while a number of small bronze rasps, believed to be of the Lisht Dynasty (*circa* 1200 B.C.) have been found in Egypt. The Assyrians, one of the earliest races to profit by the discovery of iron, left behind examples of work in this material dating back to the seventh century B.C. In Hallstadt, in Upper Austria, Roman files both bronze and iron have been discovered which were invariably cut on one side only.

Little mention is made of files in the history of medieval times except for the work of two monks, both prominent metalworkers.

The first, St. Dunstan of Glastonbury, who died in 988, is considered the patron saint of blacksmiths. In addition to making many fine examples of the smith's craft, he also did much to improve metalworking tools. Theophilus Freslyter of the Benedictine Cloister, Helmeshausen, was the other. Towards the end of the eleventh century he wrote a book on file making in which he also gave formulae for hardening and tempering.

In the middle of the fifteenth century Nuremberg, in Germany, was the centre of file making, but later the industry moved to Sheffield, it being recorded that the first file was cut there in 1618.

Leonardo da Vinci, famed for his painting of " The Last Supper " and the " Mona Lisa," is reputed to have invented, about 1490, the earliest file-cutting machine.

We are told that later, in 1765, a water-driven machine was used in Sheffield for cutting files. It is stated that this machine could make as many files in a given time as fifty men, but was destroyed by the inventor in a fit of temper. Being made from a mild material, the blanks did not require annealing, and in order to procure a hardened surface, various secret preparations were used which served to carburise the teeth and make them hard enough to abrade other materials. It was, however, not until the beginning of the nineteenth century that machines were produced capable of cutting files with a uniformity which made possible the standardisation of the various types and cuts of files.

Manufacture

Until the middle of the last century the manufacture of files was carried out entirely by hand. The equipment required was of the simplest, consisting mainly of chisels, a hammer, and some form of lead pad upon which the file blank was rested.

The pad, in which a groove was cut to fit the shape of the file being made, was mounted upon a strong anvil in front of which the workman was seated. He would place in the groove a file blank with the tang towards him, holding it down with two leather straps passed around each end of the file. Tension was applied by the ends of these straps being held down by the workman's foot. A suitable chisel was selected and submitted to a rapid succession of blows from a hammer often weighing as much as six pounds. After each blow the chisel was moved a small but regular distance towards the workman until the tang was reached.

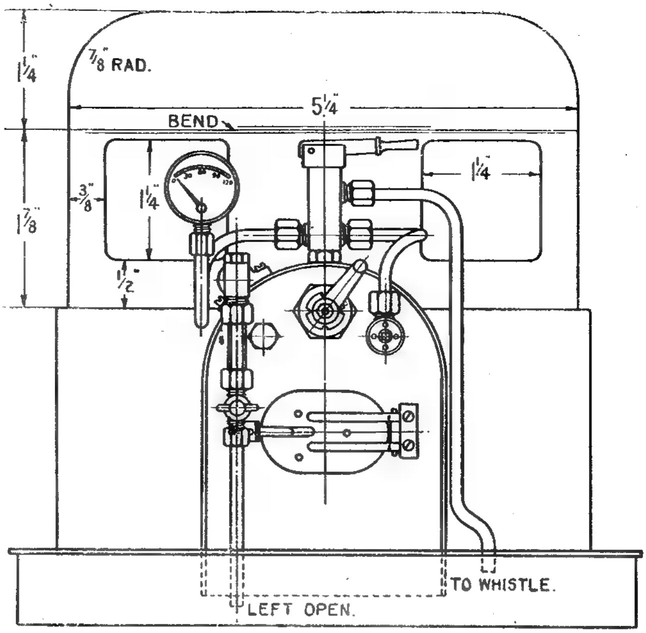
Hand-made files were made with an astonishing degree of dexterity only acquired by long practice. Many of the home craftsmen who produced these files cut the teeth at the rate of from 150 to 200 per minute.

Files are today cut in a variety of machines. They invariably depend on the raising of a burr-tooth by some form of chisel, although some may be milled or ground. The increase in quality of the modern file has been largely due to advanced knowledge of the heat treatment of steels rather than to methods of tooth cutting. Treating the material before manufacture in specially designed annealing furnaces has resulted in a steel of more uniform texture.

(*Continued on page* 325)

"L.B.S.C.'s" Beginners' Corner

Backhead Fittings for "Tich"



Arrangements of fittings for smaller boiler

BEGINNER friends may be thinking by this time that I have forgotten all about them. Not on your life—my correspondence wouldn't let me, anyway! British Railways were, unwittingly, the real culprits, for bringing out the new engine on January 30th, and giving me so little time to make drawings suitable for springing my big surprise on February 1st. As I'm slow with a pencil, it took some time; but, as Sophie Tuckshop used to say on the radio, "I'm all right now," so—to quote another radio character —"let's get on with it."

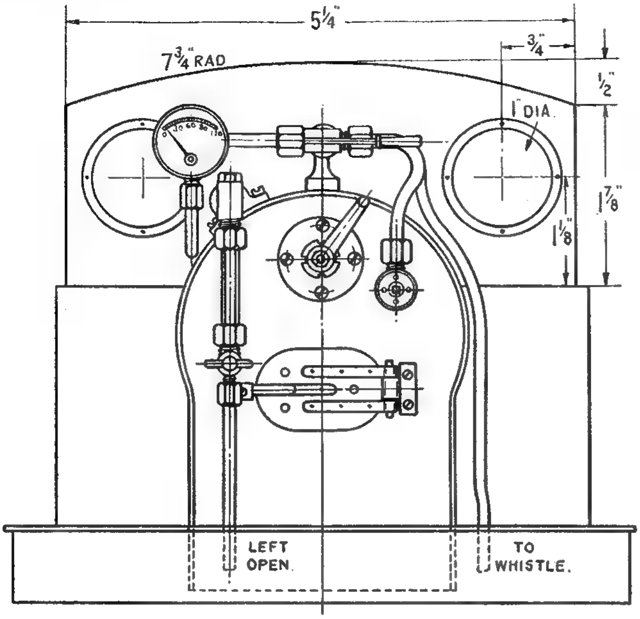
The next stage is making fittings for the backheads, and here you see the two of them, for large and small boilers, all-present-and-correct-sergeant. One thing I love to see on any locomotive, big or little, is a neat arrangement of the backhead adornments. In days gone by, when I visited exhibitions (the last I attended was in 1935) the fittings I saw on the footplates of even the prize winners, gave me the proverbial pain in the neck. Huge great square-bodied water gauges, with ridiculously small passages through them, and "taps" that either stuck or leaked; check valves or clacks with equally unsightly bodies; massive wheel valves, with just the same bodies (there must have been a mania for using square rod in those days!) whacking great unions, enormous regulator handles with unsightly stops at each end of a quadrant like the top of a tunnel, all mounted as though any place where they could be squeezed in, would do. There was no need for it, because for years I had been describing how to make small, neat, and efficient fittings; but tradition dies hard, for the same kind of fittings are being made commercially at the present time. A few advertisers have made fittings to your humble servant's published instructions, and put them on the market, in more than one case without even the courtesy of a by-your leave, or acknowledgment; but it is easy enough to make your own, as the following notes will show. Two or three of our approved advertisers supply weeny castings for water-gauge fittings, valve bodies, and so on; they may be used if desired. Otherwise, make the fittings from rod material, turning, drilling and screwing as indicated, and silver-soldering the joints, same as I usually make them. My few personal friends often chaff me about my "jewellery work"! Speaking of small castings, I notice in Reeves's catalogue, a line which I reckon he must have put in especially to please Inspector Meticulous; weeny castings of pipe fittings of the exact pattern used in full-size practice. There are elbows, tees, crosses, connecting sockets, unions, plugs and what-have-you. If the brake pipe adorning the buffer beam of any small engine had one of the proper-shaped elbows at the bottom, and the proper bend, or half-angle as the case may be, at the top, it would certainly look the cat's whiskers. A touch of realism here and there, puts the jam on the bread!

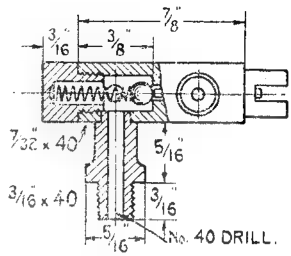
Different Whistle Valves

Apart from the regulator gland, which I have already described, the only other variation between the layouts on the larger and smaller boilers, is in the combined steam turret (or fountain) and the whistle valve. I have shown a vertical one on the smaller boiler, and a horizontal one on the larger boiler; in the latter case, the whistle-valve handle would be too close to the cab roof, if a vertical fitting were used. If anybody fancies the

horizontal type on the smaller boiler, why, just go right ahead and fit it. Apart from the way steam gets into the valve, there is no fundamental difference in the two fittings. Steam and water gauges, and firehole door, are the same for both boilers; so is the blower valve, which I have already described, as it forms one fixing for the hollow stay. On the larger boiler, I have shown gap between the socket and rule. Simple, sure-lie, as they say down Sussex way. Add this to ⅜ in., and you get the length of the top fitting between shoulder and spigot.

If you can get gunmetal or bronze rod for the fittings, use it; if not, brass will do, as there is no movement and no wear. Chuck a piece of ¼ in. round rod in the three-jaw, face the end,





Horizontal turret

Left—Arrangement of fittings for larger boiler

the pipe, which leads down to the whistle, curved to dodge the cab window, as the driver stands on that side, and the window is smaller than on the engine with a smaller boiler. "Variety is the spice of life"! The drawings of the two backheads show clearly the arrangement of the fittings, without any detailed explanation being needed, so all we have to do, is to make and erect them as shown.

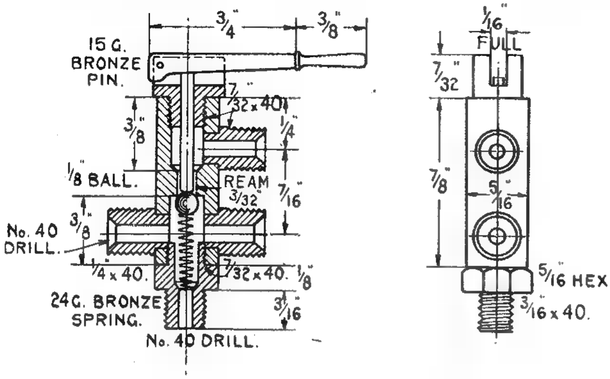
Water Gauge

First of all, I must call attention to one particular point. The face of the socket into which the top fitting of the water gauge is screwed, and the bush in the backhead which receives the bottom fitting, are not in the same plane. The socket is level with the wrapper sheet, whilst the bush sticks out beyond the backhead. This is shown in the side view of the gauge. Therefore, the lengths of the top and bottom fittings have to be made to suit; and the top one will be longer than the bottom, in order to get the parts which carry the glass tube, into a straight line. It isn't any use of my giving a definite measurement for this, because it may vary, according to the degree of workmanship in different boilers; some may have the backhead projecting more than others, and some bushes may have a thicker flange. Well, all you have to do, is to put your steel rule edgewise across the bush, with the upper part passing across the face of the socket, and measure the centre, and drill ⅝ in. deep with No. 21 drill. Screw the end ¼ in. × 40 for about ¼ in. length, with a die in the tailstock holder, and part off at 9/16 in. from the end. Reverse in chuck, tap the other end 3/16 in. × 40 for about 3/16 in. down; slightly countersink the end, and skim off any burr. At ¼ in. from the tapped end, make a centre-pop—be careful how you hit the punch, or the fitting will be distorted—and drill it 5/32 in. or No. 21.

Chuck a piece of 5/16 in. round rod in three-jaw; face the end, centre, and drill to about ¾ in. depth with No. 40 drill. Turn down 3/16 in. of the end to 7/32 in. diameter and screw 7/32 in. × 40. Part off at a full ½ in. from the shoulder. Reverse and rechuck in a tapped bush. For this, chuck any odd bit of rod 5/16 in. diameter or larger. Face the end, centre, and if a short bit (½ in. length is ample) drill right through with 3/16-in. or No. 12 drill, tap 7/32 in. × 40, countersink the end, and skim off any burr. Make a dot on it opposite No. 1 jaw, so that when removed from the chuck, it may be replaced again in same position. Screw the fitting into the bush, and turn down enough of the outside, to ¼ in. diameter, to leave a flange 3/32 in. thick. Then further turn down the end to a tight fit in the hole in the side of the piece that holds the glass. Don't forget that the length between the face of the shoulder at the screwed end, and that on the smaller end, must be ¼ in. plus the distance marked *A* in the side view.

When you have got that right, face off the surplus, to leave the spigot $\frac{1}{16}$ in. long. This is then pressed into the hole in the side of the piece made previously. Put it aside until the bottom fitting is made, so that you can silver-solder them both at the same heat.

For the bottom fitting, chuck the $\frac{5}{16}$-in. rod again; face, centre, and drill down to $\frac{5}{8}$ in. depth with No. 40 drill. Turn down $\frac{3}{16}$ in. of the end to 7/32 in. diameter as before, and screw 7/32 in. × 40. Part off at a full $\frac{7}{8}$ in. from the shoulder. Put very similar nipple is fitted, to carry the bottom end of the glass. Chuck the $\frac{1}{4}$-in. rod in three-jaw; face the end, centre, and drill No. 40 for about $\frac{5}{16}$ in. depth. Open out with No. 21 drill for 3/32 in. depth. Screw $\frac{1}{8}$ in. of the outside with $\frac{1}{4}$ in. × 40 die, and part off at 7/32 in. from the end. Reverse in chuck, and grip by the threaded part, which will be all right as long as you don't tighten the chuck sufficiently to damage the threads; then turn down $\frac{1}{16}$ in. of the end, to a tight fit in the hole nearest the screwed end, and squeeze it in. The joints in both fittings can then be silver-soldered; simply apply wet flux, heat to medium red, touch the joints with a thin strip of silver-solder, of best grade, let cool to black, pickle, wash off and clean up. I always use Easyflo, and the special flux sold for use with it, on jobs like these. To clean up, I just hold the pieces against the tip of a small revolving wire brush, mounted on a spindle which is stuck into a taper hole in the shaft of my electric grinder. As the grinding spindle runs at nearly 3,000 r.p.m., it only needs a few seconds' treatment to make the



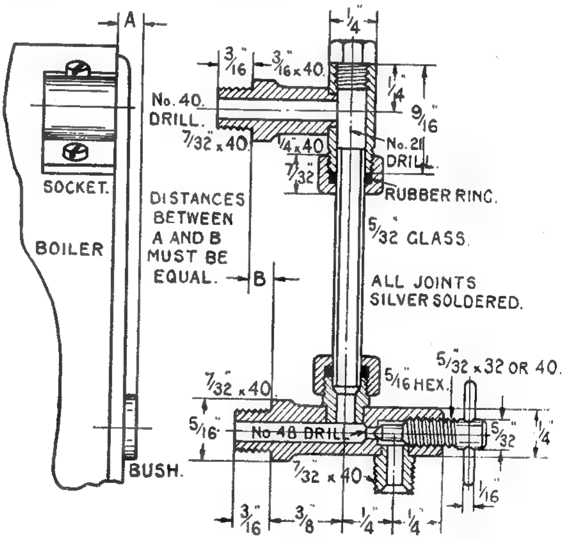
Combined whistle valve and turret—vertical type

your tapped bush in the chuck again, and screw the fitting into it. If you have replaced the bush correctly, the fitting will run truly. Centre the end, and drill No. 48 until the drill breaks into the No. 40 hole drilled from the other end. Open out to $\frac{1}{4}$ in. depth with No. 30 drill, and bottom the hole to $\frac{5}{16}$ in. depth with $\frac{1}{8}$-in. D-bit. Tap 5/32 in. × 32 or 40, and be careful not to let the tap scrape the seating.

If you have the coarser thread, use it, as the valve is quicker-acting. Slightly chamfer the end of the fitting for sake of appearance.

Be careful over the next bit. At $\frac{3}{8}$ in. from the shoulder, make a centre-pop; at $\frac{1}{4}$ in. from the tapped end, exactly opposite to the first, make another. The easiest way to get them directly opposite is to mark the spots before taking the fitting out of the tapped bush. Make one mark opposite a chuck jaw set vertically, at its highest point; then turn the lathe mandrel half-a-turn, so that the chuck jaw is vertical again, but at its lowest point. If the second mark is now made on top of the fitting, it must of necessity be opposite to the first one. Centre-pop both marks, and drill them 5/32 in. or No. 21, letting the drill pierce the centre passages.

By this time you know how to make union screws, having made them for the mechanical lubricator, and so on; so fit one, made from 7/32-in. round rod, and screwed 7/32 in. × 40, into the hole in the tapped end of the fitting; see sectional illustration. In the other hole, a



Details of water gauge

fittings bobby-dazzle, as the cleaner boys on the L.B. & S.C. Railway used to say. Alas, both boys and railway are now just a legend; I knew a few who would have made the full-sized *Britannia* resplendent in a way that even Mr. Riddles would never have imagined! They just couldn't have resisted turning that shapely little chimney into a gleaming silver ornament, for a start; and no signalman would ever have had any excuse for not seeing the numbers on the smokebox door. Those were the days!

Valve and Gland Nuts

The valve pin can be made from 5/32-in. rustless steel, or nickel or phosphor-bronze. Chuck in three-jaw, and turn 5/32 in. length to $\frac{1}{8}$ in. diameter ; form a cone point on the end, by the method described for the depressor pin of the spring-balance safety-valve. Screw the next $\frac{1}{4}$ in. length, 5/32 in. $\times$ 32 or 40 to match the tapped hole in the fitting, and part off at $\frac{7}{16}$ in. from the shoulder. Drill a No. 53 cross hole in the end, and squeeze in a piece of $\frac{1}{16}$-in. steel, rustless for preference. The end of the valve pin should be chamfered, and the ends of the cross pin rounded off, to save any risk of skinned fingers.

For the nuts, chuck a piece of $\frac{5}{16}$-in. hexagon rod in three-jaw ; face, centre, drill down with No. 21 drill for about $\frac{5}{8}$ in. depth (this is enough for the two) open out to 5/32 in. depth with 7/32-in. or No. 3 drill, tap $\frac{1}{4}$ in. $\times$ 40, and part off a full 7/32 in. from the end. Chamfer the corners of the hexagon at both ends. The plug for the top fitting is made from $\frac{1}{4}$-in. hexagon rod. Face off, turn down $\frac{1}{8}$ in. length to $\frac{3}{16}$ in. diameter, screw $\frac{3}{16}$ in. $\times$ 40, part off at $\frac{1}{4}$ in. from the end, reverse in chuck and chamfer the hexagon.

How to Erect the Gauge

Smear the threads with plumbers' jointing, and screw the top part into the socket, and the bottom into the bush. Line them up with a 5/32-in. drill, or a piece of 5/32-in. silver-steel (which is usually straight) so that when the drill or rod is inserted through the top fitting, it drops easily into the recess in the bottom one. If they won't line up without risk of stripping the threads, either file a weeny shade off the bush and socket faces, or use one or two shim washers made from copper or brass foil. Cut a piece of glass tube 5/32 in. diameter, by nicking it with a three-cornered or half-round file and snapping off, to such a length that when dropped in place, it rests in the bottom recess, and comes almost up to the hole in the top fitting, as shown in the section.

I use rubber rings for packing, putting a piece of rubber tube about $\frac{3}{4}$ in. long, on a short bit of 5/32-in. rod, and holding same in three-jaw. The lathe is then run at high speed, and a piece of fine glass-paper held against the rubber tube until it is reduced sufficiently to enter the gland nuts. A wetted safety-razor blade is then applied to the tube at 3/32 in. intervals. When you push the tube off the rod, it falls into rings. Wet the glass tube, push it through the top fitting, put on a wet ring, then the two nuts back to back, then another wet ring. Let the tube drop into the recess, slide the bottom ring down, and screw the nut over it. Push the upper ring as high as it will go, and screw the other nut over that. The nuts want to be only just a little more than finger-tight, otherwise the glass may break, through not being able to expand. Finally, screw the plug in the top, with a smear of plumbers' jointing on the threads—don't get any into the glass tube, on any account—and Bob's your uncle as far as the water gauge is concerned. Tip—if the glass is too tight in the fittings when you first try it in place, either poke a 5/32-in. reamer down, right into the recess, or put a size larger drill in, say, No. 20. Glass tube is decidedly *not* made to " mike " measurements, and some kinds are larger than others, although nominally the same size ; and sometimes it is a wee bit oval. It must not be tight, either, in the fittings or the nuts, or breakages will be frequent ; whereas a properly-fitted glass will last for years.

The Humble File

(*Continued from page* 321)

Humble though the file may be, it is, without doubt, the most useful of hand tools. Despite the immense mechanisation of the engineering industry the process of filing remains of first importance. Michaelangelo, to prove his talent, once drew a perfect circle freehand. Difficult though elementary, it revealed his genius. Similarly the skill of the metalworker is shown by the way he masters the fundamental operations peculiar to his craft.

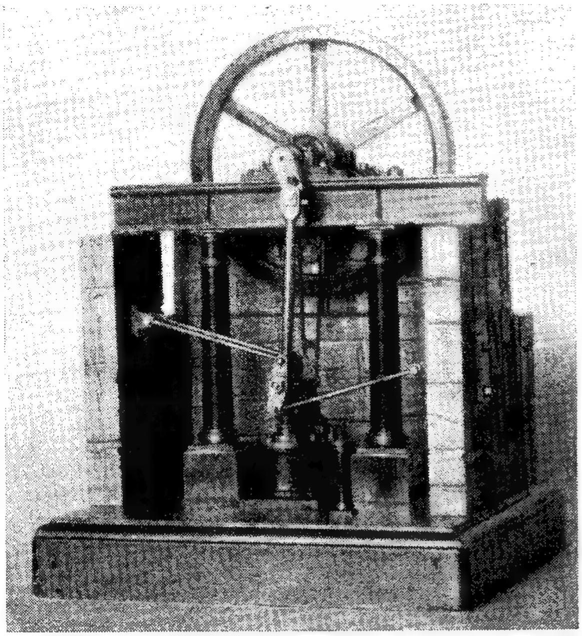
Tests have revealed that the work done by a file varies according to the character of the metal on which it is employed, the amount of pressure exerted for each cut, and the cut of the teeth. It is bad practise, though frequently done, to use one file for all metals. In good filing, files of different kinds should be chosen with an eye to the resistance offered by the metal which has to be filed. Other factors which affect the output of a file are the heating of the metal being filed (this may increase the weight of metal removed) ; the breaking of the point of the teeth, which lowers the output, and accidental oiling of the work, which lessens the amount of metal removed.

The teeth of a file should always be carefully brushed when the file is put away. If, as in the smaller-sized and finer grades of teeth, dirt and grease can cause clogging, the best way to free the file is as follows : take a thin piece of hard sheet brass, and push it along the grooves across the file. It should be held at an angle of about 45 deg. to the face, and may be about $\frac{1}{2}$ in. wide. After being pushed across two or three times, the teeth of the file make grooves in it which should exactly fit the shape of the sides of the teeth. With this the grooves may be thoroughly cleaned out, leading to a great improvement in the cutting of the file.

Very often the amateur uses a file too large or too small for his work. He will buy, for example, a 6 in. to 8 in. in a medium cut or second cut. It would be far better to buy a 10 in. second cut, and a 6 in. smooth file. The first will enable him to remove the metal quickly, and the second to put a good finish on the work.

A Model Early-Type Engine

by Frank D. Woodall



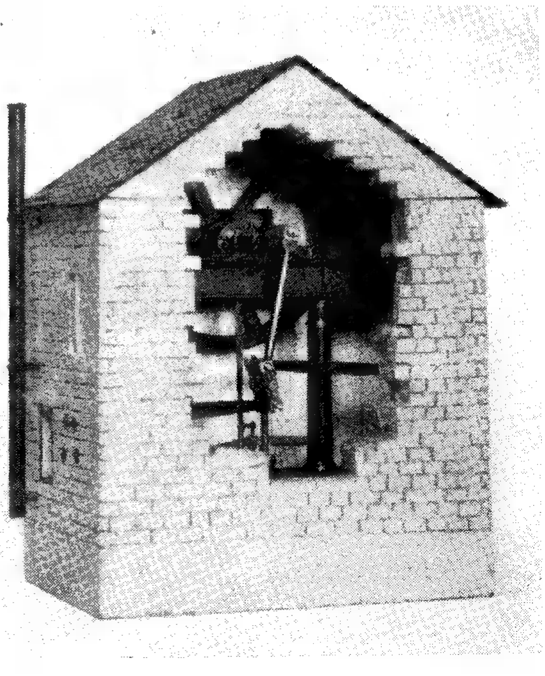
The model as shown at the "M.E." Exhibition, 1933

SEVERAL model engineers have remarked about the absence, during the last three years, of any articles in THE MODEL ENGINEER describing any of my models of early mining equipment. The reason: the installing of a larger lathe, which even though new, needed much improving. This was then followed by the rather long job of thoroughly renovating an old two-speed Morgan three-wheeler.

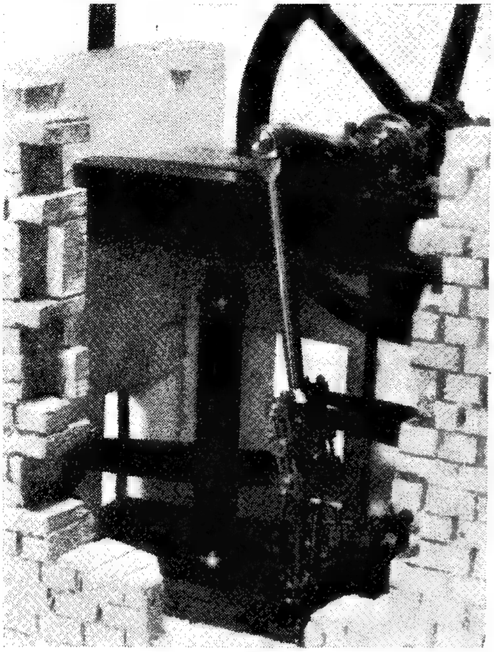
A year or so ago, model engineering was resumed, but not with a new model. The first photograph shows my first attempt at model building as it was when exhibited at the 1933 MODEL ENGINEER Exhibition. For about ten years the engine reposed in a bookcase and was only run at very infrequent intervals. Then, having collected a considerable amount of information on this type of engine, I built another, which was described in THE MODEL ENGINEER during December, 1943. The previous model then lay in a store cupboard for several years. I did not feel like scrapping it, seeing that it was my first attempt, yet I did not consider it good enough to be on view. It must have had some good points because it had been highly commended at the above-mentioned exhibition.

Its chief fault, and one that is still retained, is that engines of this type, with the cylinder at the bottom, were nearly always colliery winding engines, whereas the model is just "engine." Perhaps the most notable exception was the Weatherhill haulage engine near Stanhope, now in York railway museum. The model has been rebuilt with the idea of some day constructing an incline with winding or haulage gear.

Besides the obvious alteration of putting the engine in a house, the floor line has been brought level with the cylinder cover; not only is this more in keeping with actual practice, but it allows the cylinder and bases of the



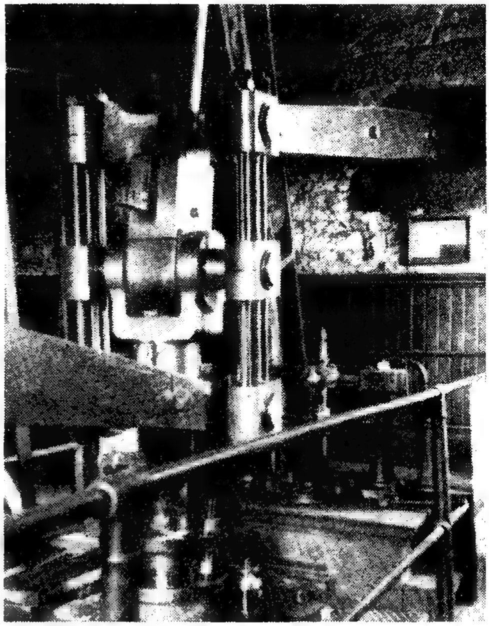
The model as recently rebuilt: cylinder about $1\frac{3}{16}$ in. stroke by $\frac{5}{8}$ in. bore



A close-up of the model looking into the house, and showing parallel motion copied from the full-size engine

columns to be rigidly attached to a steel plate out of sight below the floor. This obviates the bugbear of misalignment due to slight warping in the wood of the house. The entablature is also bolted between the walls for the same reason, thus making the model wider by the thickness of two walls.

Besides a new crank with a better proportioned web and a longer piston-rod to prevent the crosshead descending too close to the stuffing box, the main alteration of a purely mechanical nature was to the parallel motion. When I first made the model, it was with difficulty, and after several attempts I produced four slender fish-bellied round radius bars, only to find years later that they should be flat. I have seen both thin castings and wrought-iron plate used on this type of engine. The model now has correct flat bars and the centre links have been made as the originals invariably were. A slip eccentric and gab-gear has also been added. Another improvement is that, where commercial nuts had been used, they have been reduced across the flats to a more correct size.



A view of a S. Yorks colliery winding engine. The bearings for the parallel motion are let into the engine-house wall

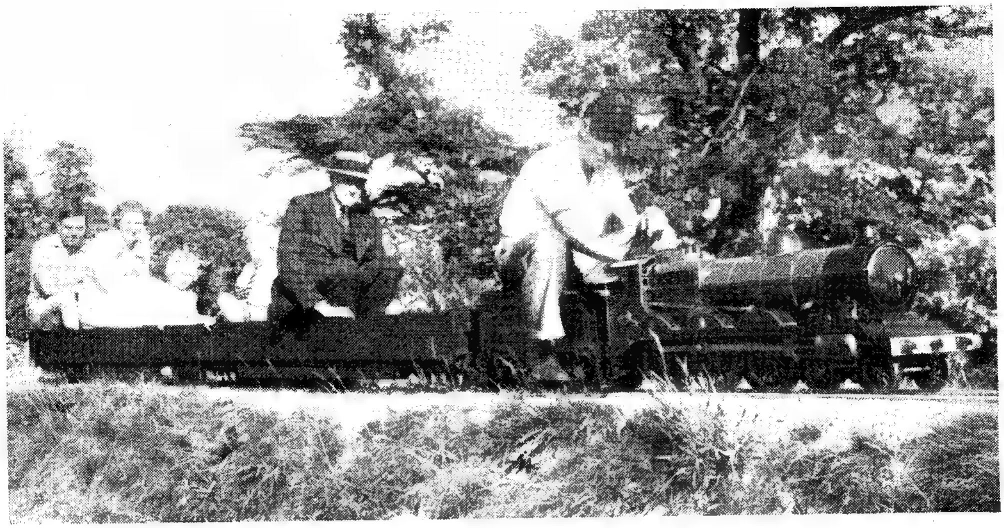
There are a few engines of this type in use in S. Yorkshire and the midlands, but I have not yet seen any in Lancashire.

For the Bookshelf

The Steam Locomotive of Today, by M. P. Sells. (London: The Locomotive Publishing Co. Ltd.) 250 pages, size $5\frac{1}{2}$ in. by $8\frac{1}{2}$ in. Numerous illustrations in line and half-tone. Price 10s. net.

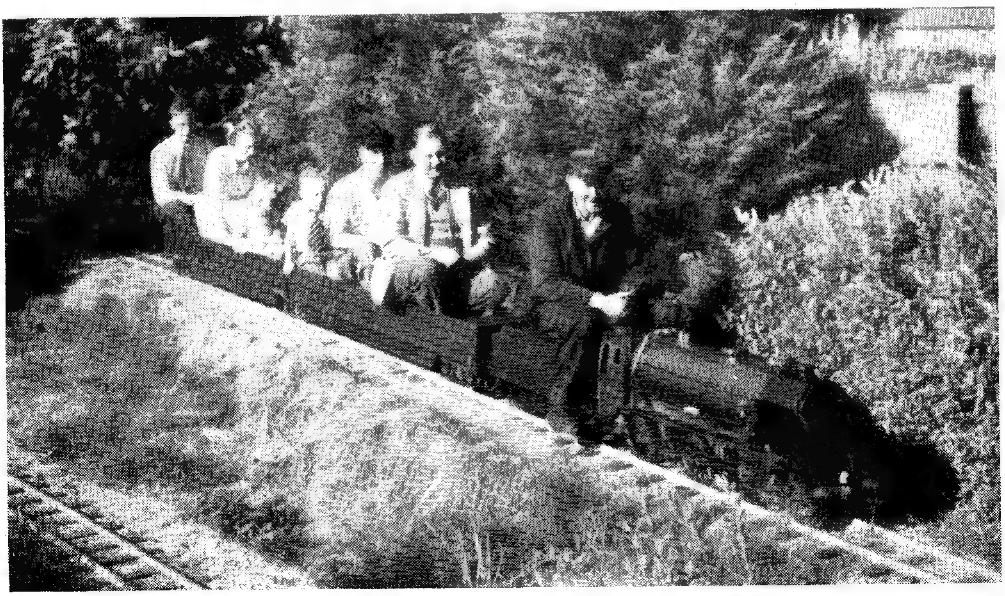
Part of this book was originally published in 1936 under the title of *How the Locomotive Works and Why*. It now appears in a thoroughly revised and enlarged form, and it is to be cordially recommended as an admirable and handy introductory volume on the steam locomotive. Mr. Sells was formerly chief mechanical engineer to the Nigerian and Rhodesian Railways, so he has been able to approach the subject in the light of practical experience.

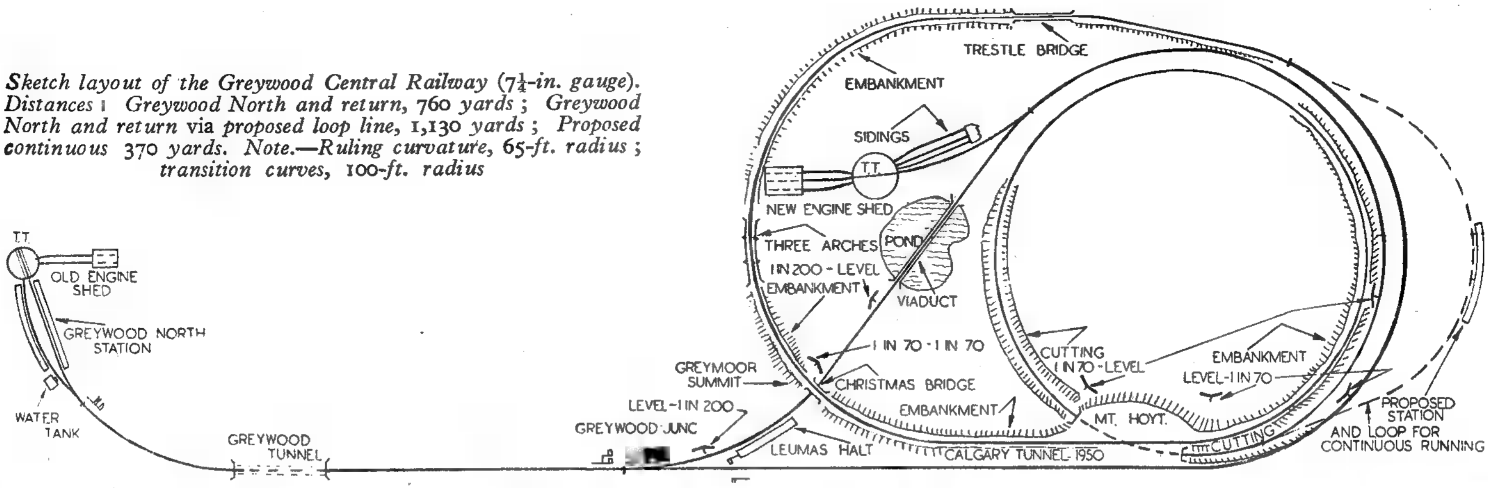
The fund of information to be found in the book is essentially technical and instructive, while it is based on up-to-date practice as applied to all the main features of modern steam locomotive design. The illustrations, several of which are in the form of folded inserts, are clear and well reproduced, ensuring that students and others shall acquire a complete understanding of the knowledge gained from the text.



GREYWOOD RAILWAY DEVELOPMENTS

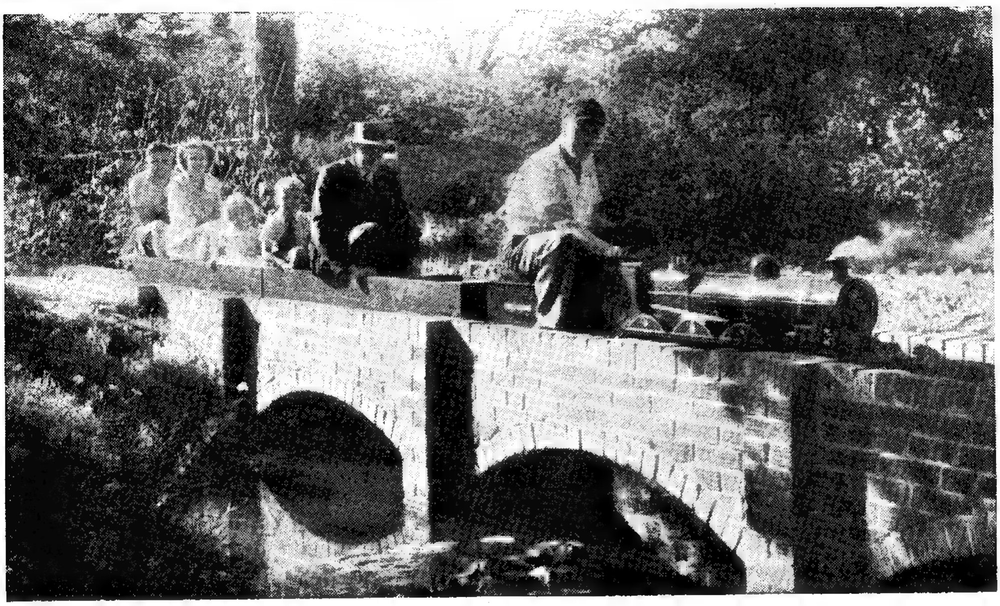
SINCE we published, in November, 1948, some description of the Greywood Miniature Railway and its equipment, considerable extensions have been planned and made. By undertaking quite a heavy programme in the civil engineering department during last winter and spring, Mr. J. O. C. Samuel and his happy little band of enthusiastic helpers have succeeded in increasing the total length of track from 400 yards to half a mile. The accompanying plan shows the layout as it is now and also a proposed further extension which is to be put in hand. When the work has been completed and a very necessary signalling system installed, the Greywood Miniature Railway will be, without a doubt, one of the finest $7\frac{1}{4}$-in. gauge railways in England; in fact, we doubt if there has ever been another to equal it.





Sketch layout of the Greywood Central Railway ($7\frac{1}{4}$*-in. gauge*). *Distances:* *Greywood North and return*, 760 *yards*; *Greywood North and return* via *proposed loop line*, 1,130 *yards*; *Proposed continuous* 370 *yards. Note.—Ruling curvature*, 65-*ft. radius*; *transition curves*, 100-*ft. radius*

The extensions have involved some very heavy engineering works in the form of cuttings, embankments, gradients, a second tunnel, a viaduct, and of course, track laying. Practically the whole of the track is laid with light alloy, flat-bottomed rail produced by Fenlow Products Ltd. of Weybridge, which is highly successful. The running is noticeably quiet and the riding is easy and comfortable. All curves are properly transitioned, and there are plenty of them. But the trains can be run at high speed without any discomfort or sense of danger. The minimum radius of curvature is 60 ft. and the steepest gradient is 1 in 75.



The viaduct, which is a massive and handsome structure in red brick, provides access to the lower part of the garden which would otherwise be cut off by the embankments. The highest point is at Christmas Bridge, some 10 ft. higher than the lowest level on the line. The trestle bridge marked in the plan is removable, so as to allow lorries from the nearby road to enter the garden through the gate alongside.

All this work has been so skilfully planned and carried through that, as seen from the house, there is very little evidence of the existence of the railway.

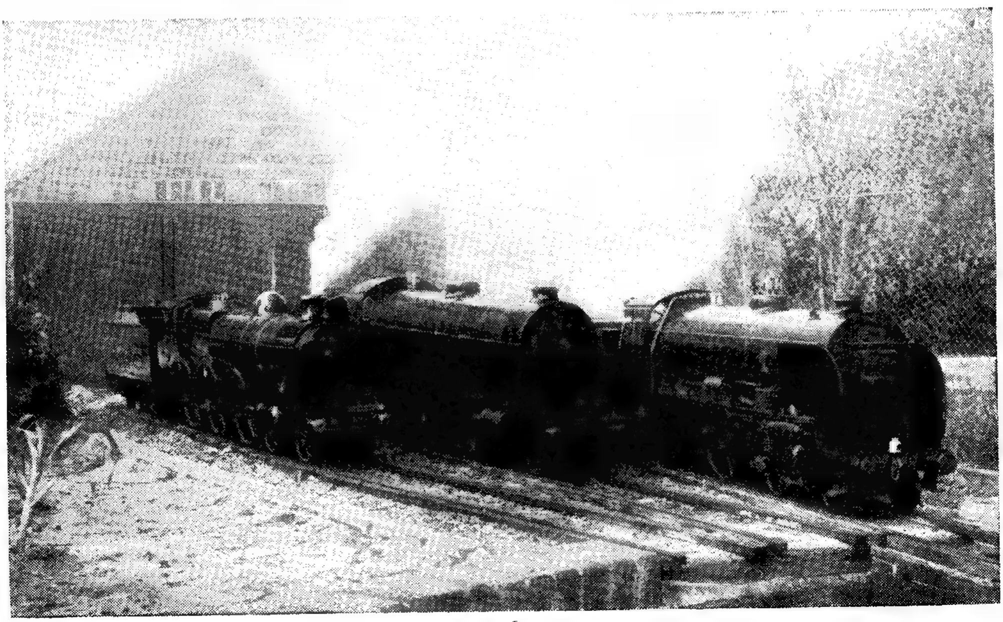
The motive power has been augmented by the acquisition of another locomotive; this is a Great Central 4-6-0 express engine, *Immingham*, built by Bassett-Lowke as long ago as 1911 and formerly owned by Mr. C. R. Jeffress of Kenton. The engine has been thoroughly overhauled and adjusted, and is now in better form than ever; moreover, she has been beautifully re-painted and finished in the old Great Central livery which, in these days, is really good to see again. The particulars were obtained and provided by Mr. A. B. MacLeod, Stores Superintendent, British Railways, London Midland Region, who went to a great deal of trouble to ensure absolute accuracy; in only one detail does the painting differ from the prototype, and that is the railway company's title on the tender. Instead of "GREAT CENTRAL," the title is rendered as "GREYWOOD CENTRAL," but in true-to-scale reproductions of the prototype's distinctive lettering, which produces a very pleasing effect.

The 4-6-2 engine *Eureka*, after more than three years of constant useage, is due for shopping. We understand that she, too, will be re-painted in Great Central style, and it should suit her admirably.

Another interesting engine, which is at present on loan to the Greywood line, is Mr. Douglas Bastin's fine S.R. "Schools" class 4-4-0, *Dulwich*, which was described and illustrated in THE MODEL ENGINEER for August 21, 1941. This engine is a splendid performer, but she gives her best work when driven with due regard for all the niceties of locomotive driving; she strongly disapproves of that kind of driver who merely opens the regulator and hopes for the best! And she seems to prefer being driven "from the lever" rather than from the regulator. One of the photographs reproduced herewith shows all three of these engines in their shed yard, waiting to be put to bed after a very strenuous afternoon's running. It will be noticed that none of them is really out-of-scale; even *Eureka*, the free-lance Pacific, is well-proportioned, and within the limits of the scale loading-gauge, while the other two are very close copies of their prototypes.

The proposed further extension of the track will include another station, close to the southern boundary of the garden. It will entail the provision of two junctions with the existing main line. It will also provide a continuous section round

which trains will be able to run as many times as desired. Obviously, this will necessitate the provision of adequate signalling, and the arrangements have already been decided. The existing signalling system is somewhat sparse, but it has sufficed for all needs hitherto; the signals and points are operated and interlocked electrically from the control panel in the signal-box, but there has been some trouble with it in damp weather. This system, therefore, is to be scrapped and replaced by a manually-operated mechanical system; a descriptive article dealing with this will be written and published when the new system has been installed. It will mean, of course, that the signalman will have to *know* his job and to have his wits about him when traffic is heavy, since there are sometimes as many as three trains running at once on a line that is single throughout! All drivers, in future, will have to know how to read signals and to obey them, and it will add a great deal of interest to operating the traffic.



IN THE WORKSHOP

by "Duplex"

No. 84—*A Motor Drive for the $3\frac{1}{2}$-in. Drummond Lathe

THE cone pulley used on the countershaft is ■ standard step pulley, corresponding with the mandrel belt pulley and having ■ bore of 1 in. diameter. The countershaft itself is, therefore, made from ■ length of 1 in. dia. round mild-steel, shouldered down at either end for the bearings of $\frac{3}{4}$ in. bore.

this situation will be described later in connection with ■ fine feed mechanism.

Finally, the large pulley is fixed to the shaft and its sleeve by means of two Allen set-screws located at an interval of 90 deg.

The small fitting, just visible in the photograph of the countershaft unit immediately to the right

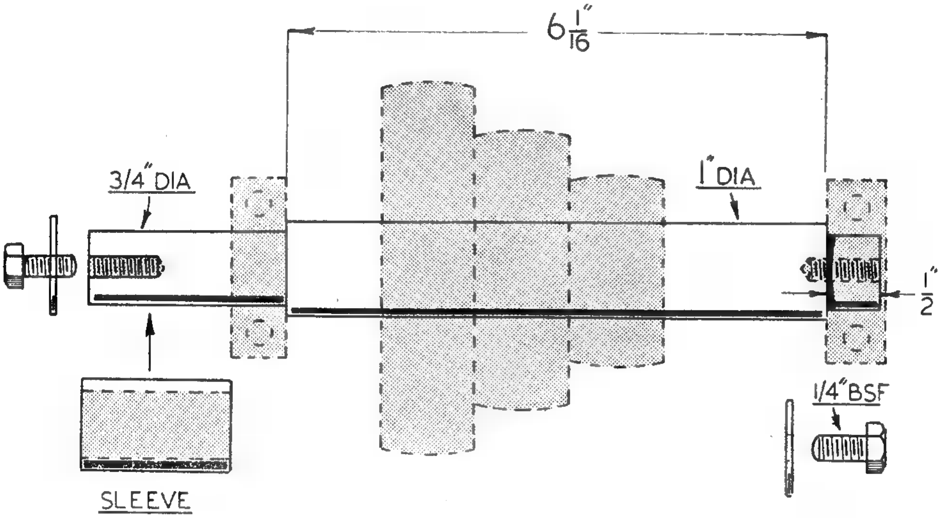


Fig. 9. The countershaft with its pulley and bearings

This material is turned between the lathe centres, after it has been accurately centre-drilled at either end while mounted in the four-jaw chuck and supported in the fixed steady. The shaft is also drilled axially and tapped $\frac{1}{4}$ in. B.S.F. at the ends, so that ■ hexagon-headed screw can be fitted to clamp the inner races of the ball-bearings against the shoulders machined on the shaft. At the left-hand end of the shaft, as seen in a previous photograph, the large pulley carrying the V-belt is mounted on ■ split sleeve, bored $\frac{3}{4}$ in. in diameter to fit the end of the shaft and having an outside diameter of 1 in. to fit the bore of the pulley. This sleeve projects beyond the end of the shaft and ■ large washer or ■ small grooved pulley is carried on the axial clamp-screw, so that, when this screw is tightened, the sleeve presses the inner ball-race against the shoulder on the shaft and secures the bearing in position.

The purpose of fitting ■ small cone pulley in of the step pulley, is for keeping the mandrel driving belt clear of the revolving countershaft when, as will be described later, the drive is arranged to traverse the saddle with the lathe mandrel remaining stationary.

This belt rest is secured in place by one of the bolts fitted to the bearing hanger. As before, the inner race of the ball-bearing at the right-hand end of the shaft is clamped against the shaft shoulder by means of ■ hexagon-headed screw and washer. It is advisable to fit ■ metal cap or cover to the outer face of this bearing in order to prevent the entry of chips into the working parts. The right-hand end of the countershaft can, if required, be extended to carry ■ belt pulley for driving the lathe overhead gear; when this is done, however, ■ sleeve should be fitted to the extended portion of the shaft in order to clamp the inner ball-race, as arranged at the other end of the countershaft.

The Belt-tensioning Device

To avoid damaging ■ V-belt, it is essential that

Continued from page 263, "M.E.," February 22, 1951.

some means of slackening the belt should be provided, so that it can be easily shifted on the pulleys without being stretched. Even when a flat belt is fitted, this arrangement will save stretching the belt unevenly and so possibly causing it to run out-of-line on the pulleys. As it will be in constant use, the belt-tensioning device should be easy to operate and well within reach of the operator standing at the front of the machine.

Although the lever of the tensioning device illustrated has but a short travel, it is, nevertheless, smooth-working and can be moved in either direction by a touch of the finger.

The mechanism works on the toggle or over-centre principle, as represented in the accompanying diagram ; that is to say, at the extreme end of the lever's forward travel the moving parts pass beyond the centre-line joining the

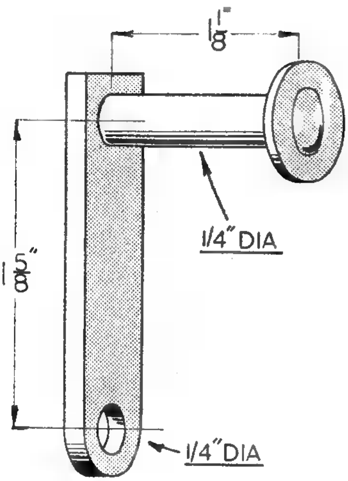


Fig. 10. *The belt rest*

lower pivot and the upper point of application ; the greater the belt pull, the more firmly is the device then locked, but the control lever can, nevertheless, unlock and operate the mechanism quite easily.

The device also has the advantage that it is self-contained and needs no springs. In a previous photograph of the countershaft unit, the lever is shown in the position it occupies when the belt is tightened, but in the illustration, here given, the control lever has been moved to slacken the belt.

Variation of the belt's working tension is effected, after the lower pivot pin has been removed, by screwing the forked pivot *A*, Fig. 13, either up or down in the threaded plate *B* ; this adjustment will be facilitated if the pin is made a push fit so that it can be withdrawn with the fingers. If preferred, as illustrated in the accompanying drawing, the forked pivot can be made a sliding fit in a bushing screwed into the base-plate ; the tension can then be adjusted, after the belt has been tightened, merely by turning the

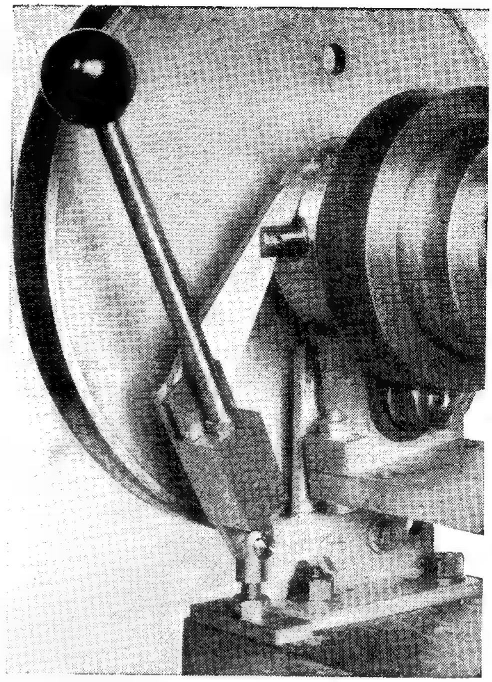


Fig. 11. *The belt-tensioning device in its open position*

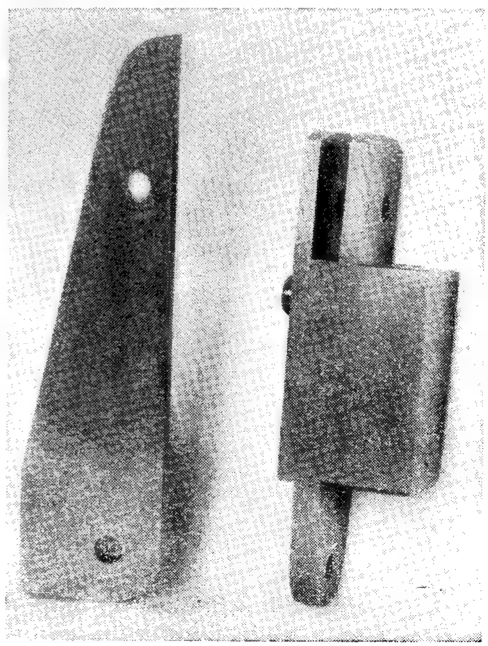


Fig. 12. *The upper and lower toggle levers*

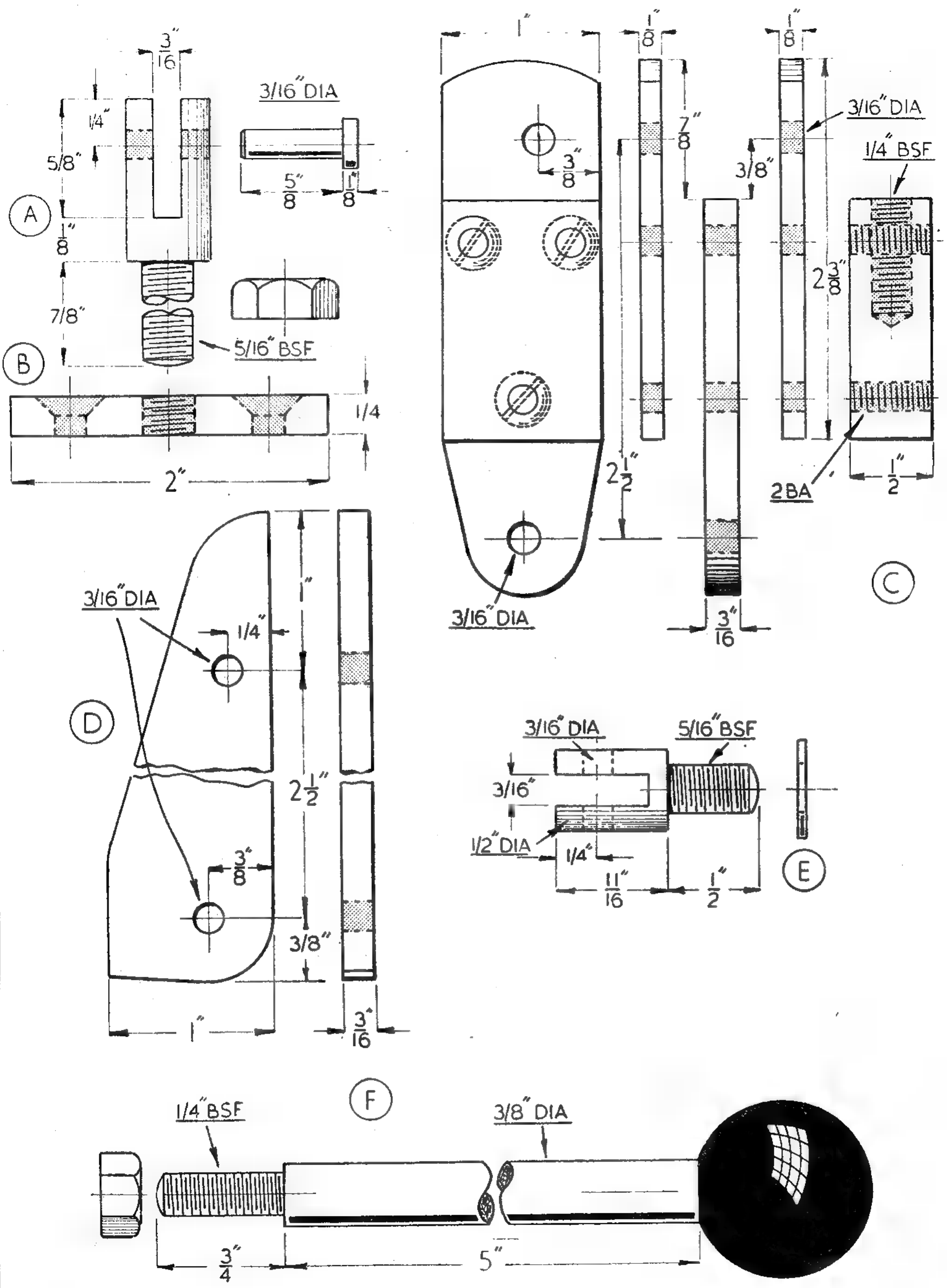


Fig. 13. *"A"—the lower toggle lever fork with its base "B"; "C"—the lower toggle lever; "D"—the upper toggle lever; "E"—the upper toggle lever fork; "F"—the control handle*

bush and afterwards securing it with its lock-nut.

The lower member of the toggle mechanism, *C*, can be machined from the solid, but it is much more easily built up from flat steel in the manner illustrated. To give a neat appearance and to allow it to clear the operating lever, the parallel joint-pin is made a light press fit in either of the strips forming the forked joint; this is done by not allowing the reamer to go right through when reaming the hole for the joint-pin. When the control lever is moved forward to tighten the belt, the lower end of the toggle lever *D* abuts against the floor of the forked part of the lever *C*.

These parts require careful filing and fitting to ensure that the joint becomes locked almost

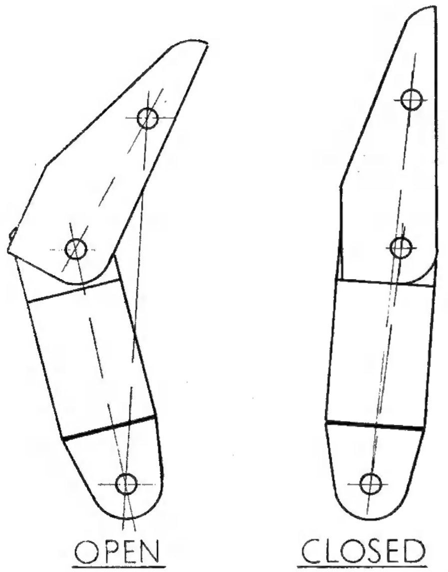


Fig. 14. *Showing how a toggle mechanism operates.*

immediately after the over-centre position of the parts has been reached. The operating lever with its ball handle is screwed into the toggle fork assembly and secured in place with a lock-nut, or, if preferred, a set-screw can be used for this purpose. The upper end of the toggle lever *D* is pivoted in a forked pillar screwed into the bearing housing and, here, again, a parallel joint-pin is used and made a light press fit in either of the tines of the fork. The end of this lever is shaped in the form of a beak, which comes into contact with the bearing housing and so checks

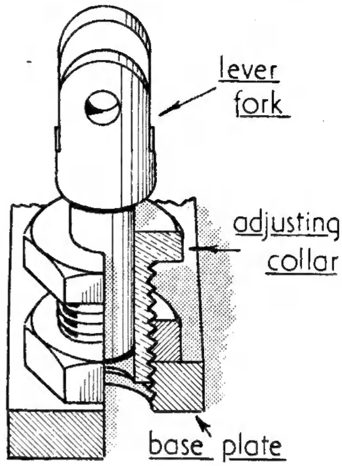


Fig. 15. *Alternative form of fork for adjusting the belt tension*

the backward movement of the control lever when the belt is slackened. No forward stop is needed, as the tension of the belt keeps the toggle joint locked.

It will be noticed that the large driving pulley illustrated has a flat-faced rim; this gives a very satisfactory form of drive, known as a V-flat drive, and at the same time the V-belt is free to align itself on the pulley and is not subjected to wear on its side faces. The wooden base of the countershaft unit is secured to the bench top with four wood screws so as to align the two step-pulleys correctly; the motor unit is then attached to the bench to bring the V-belt pulleys into line.

Both units should be positioned to allow an ample range of movement for adjusting the working tension of the belts.

Miniature Ball-Bearings

We have recently received a sample of an extremely small ball-bearing now available in this country after the lapse of several years. Due to the relaxation of restrictions on imports from Switzerland, Messrs. Miniature Bearings Ltd., 192, Sloane Street, London, S.W.1, are now handling the distribution of these very small bearings in this country. The sample which we have is known as C 1.5; its size is 1.5 mm. dia. outside, by 0.93 mm. deep, and it consists of a pressed steel cup, a dust cover, a ball cage and three chrome steel balls. Formerly, this was the smallest standard ball-race in the world, but we are informed that it is now second to type C 1 which is a race of similar design but only 1.1 mm. dia. by 0.7 mm. deep.

These tiny little products, which appear to be perfectly efficient, can be applied to such things as: dental apparatus, aircraft instruments, scales, meter, and instrument movements, clockwork mechanisms, small electric motors, pulleys, drafting machines and various kinds of pivot bearings.

PRACTICAL LETTERS

Battery Charging Circuits

DEAR SIR,—The battery charger circuit shown in a letter in your issue of December 28th, shows a good method of obtaining 12 V and 6 V output connections without introducing extra resistors or switching. However, some of the results of the calculations quoted appear to be based on unwarrantable assumptions.

When charging from, say, a motor-generator circuit, conditions are easy to predict, as the current flow at any instant is unvarying. However, in a simple bridge-rectifier charger, the current flow is in the form of discontinuous pulses, repeated at the rate of 100 times a second on 50-cycle mains, and this type of current has an effect on the component ratings. Also, care must be taken when measuring charging current to use a type of ammeter which, with the same rate of charging as if the supply were a steady d.c., gives the same current reading as with the steady supply. The moving-coil meter is suitable in this respect, and is the best type to use. A moving-iron meter will read high, if it has been calibrated on steady d.c.

The r.m.s. current flowing through the transformer secondary (what may be termed the "heating effect" current), is considerably higher than the reading on our moving-coil charging ammeter, and a reduction in transformer rating should be made for this, the reduction depending mainly on the ratio of rectifier a.c. input volts to battery volts.

What about the rectifier? The maker's current ratings, unless otherwise stated, are for a resistive or inductive d.c. load, and, as for the transformer, the maximum output current rating is reduced when used for battery charging. This reduction varies with the circuit conditions, but, taking a general figure, Messrs Standard Telephones & Cables recommend a reduction in maximum current rating of 20 per cent. for charging with their selenium bridge rectifier.

The third item to be considered is the current limiting resistor. The "heating effect" current also flows through this, and the maker's current rating should be higher than the charging current. The value of resistance required can be calculated approximately, the main uncertainty being the effective resistance of the rectifier, which varies to some extent with current conditions. Experiment is the easiest way out here.

How do all these reductions in current rating work out in practice? Let us consider the practical case quoted in the letter referred to above.

The transformer secondary was rated at 24 V, 4 A, the rectifier at 5 A, and it was required to charge a 12 V battery.

The calculated results are roughly as follows:—

Transformer fully loaded with 3 A charging current.

The rectifier would deliver 4 A at full load, using the S.T. & C. reduction figure.

The resistor should be rated to carry a current about 30 per cent. higher than the charging current.

The above figures assume a moving-coil meter for measuring charging current.

Now, it is probable that many readers have battery chargers in which component ratings, worked out on the above basis, are considerably exceeded. Reputable manufacturers, however, always allow a certain factor of safety, and maximum ratings may often be exceeded without harm. But do not blame the maker if it does blow up, and do not forget that, although an overloaded component may show no sign of distress on a cold winter's night, it may object when subjected to the same treatment on a hot day.

As a constructive suggestion, I should think that the current rating of an air-cooled metal rectifier may be considerably exceeded if it were oil-cooled. Complete enclosure would be the neatest way, although provision would have to be made for oil expansion as the temperature rises. Transformer oil would be best, but for low-voltage work I suggest that thin cycle oil would be satisfactory. Local "hot-spots" would be reduced, and a check of oil temperature would give a reliable indication of loading.

By the way, referring back to the letter in the December 28th issue, the calculation using Newton's Law of Cooling should read "New working temperature *rise* of transformer equals 2.2 times rated temperature *rise*." In any case, that part of the temperature rise due to iron loss has not been taken into account.

Yours faithfully,

St. Albans. D. BECKER.

Twist Drill Grinding Devices

DEAR SIR,—As so often in the past, I opened the January 18th issue of THE MODEL ENGINEER to find a matter mentioned with which I have been keenly interested for some weeks previously—Twist Drill Grinding—or more particularly, Twist Drill point grinding, mentioned in Mr. W. D. Arnot's letter.

I have been content for years to "touch up" drills on the grinder by a curious twist of the wrist, and although they usually cut better after the treatment I was rarely able to produce those two equal curly shavings which come away from most new drills. Some weeks ago, Mr. F. F. French (late treasurer of the Romford M.E. Club) lent me a copy of THE MODEL ENGINEER for August 1913, in which was described a twist drill point grinder developed in America, which in his opinion had said the last word on the subject. After several readings of the article, and some reference to my son's trigonometrical school text-books in order to follow the proofs given therein, I agree that the design appears to be almost perfect.

It sets out to prove that every size of drill requires a different setting, and the machine described incorporates a caliper gauge which automatically varies the position of the drill according to its size. It provides a cutting edge in which clearance is *increased* towards the point.

I had always assumed from inspection that the reverse was the case.

As Mr. Arnot states, the action is based on turning the drill on the axis of a cone formed by the inclination of the axis to the face of the grinding wheel. The apex of the cone is arranged to be three times the diameter of the drill above the centre-line of the drill, while allowance is made for the fact that the cutting edges become increasingly off centre as the size of drill increases, owing to the thickness of the centre "web" increasing. This is all done in a most ingenious way, and I am engaged in trying to make a similar device at the moment, rather handicapped by the fact that no working drawings were given in the article.

I recommend anyone to read this most interesting if "elderly" article in order to appreciate the finer "points" of the twist drill.

Yours faithfully,
Gidea Park. S. W. CARR.

Old Beam Engines

DEAR SIR,—Some weeks ago in "Smoke Rings," mention was made of the interest which had been aroused by your account of the Cornish pumping engine at Prestongrange Colliery near Edinburgh.

I should like to add my support to your proposal to publish an article on, and drawings of these fine old machines, in order to stimulate interest in them, while some of the few survivors may still be seen at work. Even now I hear that a 60 and 100-in. combined engine at Glencraig Colliery, Lochgelly, Fife, is being scrapped. This may well be a compound Cornish engine on Sims' combined plan, the first of which was built by Harvey & Co. in 1836. If so, it would be of extraordinary interest as being the last survivor of a type long since discarded. Unfortunately, I have no further information on this engine. Perhaps some reader would be able to give a detailed account of it.

During last summer I was able to visit Prestongrange Colliery and see the 70-in. Cornish engine there, which is of outstanding interest in several respects, chief of which are:

(i) The piston stroke of 12 ft. Only five other engines with this long stroke are known to have been made in Cornwall.

(ii) The use of separate steam ports at the upper end of the cylinder for live and equilibrium steam. The only other example of this arrangement now existing is the 80-in. engine at Robinson's Shaft, South Crofty Mine, Cornwall, built in 1854 to the designs of Captain Samuel Grose. This, incidentally, is one of the engines which the Cornish Engines Preservation Society hopes to preserve, when it has ceased work.

Information regarding the Cornish engines remaining outside the county is very incomplete, apart from the fourteen at the Severn Tunnel and two at the Hodbarrow Iron Mines, Millom, Cumberland, all of which are still working and the four which are being preserved by the Metropolitan Water Board.

Since visiting Prestongrange I have heard of: (1) A 48-in. at Fleet's Colliery, East Lothian, built by the Perran Foundry in 1847. I understand that it is maintained as a spare. (2) An 85 in. at Cadzoe Colliery, Hamilton, built to the designs of Hocking in 1837 and scrapped in 1944. (3) A 70-in. at Newbury Colliery, Somerset. (4) A small Cornish engine at Ullcoats & Florence Colliery, Egremont, near Whitehaven, Cumberland, which was still at work in 1949.

I would welcome further information about these or other Cornish engines, which any reader may be able to supply.

Yours faithfully,
Minehead. R. J. LAW.

DEAR SIR,—I was interested in your remarks regarding the fracture of the beam engine in the old Cornish pumping engine. I have had considerable experience of beam engines of various types in and around the Black Country, and can recall quite a number of engines which had fractured beams, all of which had been repaired in one way or another. The majority of these engines have now been broken up, but I know of at least two examples which are still in existence. They are:—

(1) The famous blowing engine at Messrs. W. & G. Glazebrook, of Netherton. This machine was installed about 1818 and is preserved on site in the original engine house. The beam, which is of cast-iron, is fractured through the centre. The fracture has been repaired by passing a stout chain round the beam, end for end, and it is tensioned by suitable screwed eye-bolts, secured to the ends of the beam.

(2) The large rotative beam engine at Messrs. N. Hingeley & Sons, of Netherton Iron Works. This machine is still in use, and drives the cogging mill. It is interesting to note that the connecting-rod is of wood. In this case, the beam, again cast-iron, is fractured at the cylinder end. The repair in this case, has been effected by plating, not an easy job, when one considers the size and weight of the beam.

Yours faithfully,
Smethwick. A. J. KENT.

Priming of Boilers

DEAR SIR,—I have just seen your reply to query No. 9876, "Priming in Locomotive Boilers."

The boiler in question is not a locomotive type but a vertical in a Sentinel steam wagon.

A superheater is an essential part of this boiler and the priming is entirely due to its omission. I fear many model engineers do not even now appreciate the value of superheating.

When I built my large scale fire engine, two $1\frac{1}{2}$ in. $\times$ $1\frac{1}{2}$ in. double-acting cylinders and a $7\frac{1}{2}$ diameter boiler, I found the water in the gauge glass surging and a certain amount of priming and the feed pump going all out to maintain the water level, I added a superheater (usual in a fire engine)—result, no surging, no priming, and pump going only half the time—such is the value of superheating.

Yours faithfully,
Bognor Regis. R. A. BRIGGS.

More Old Engines

DEAR SIR,—Here are a few more traction engines to add to Mr. Todd's list. They are all in Cheshire.

Middlewich. Just opposite the railway station, are two traction engines, a Burrell single-crank compound, and a Ruston Proctor, Class Sc, No. 51053. The Ruston Proctor is in poor condition, all controls are rusted solid. It has a swivelling driving seat. The Burrell is in better condition, but the number plate was obscured by rust.

Elworth. Near Sandbach station, in a contractor's yard, are a Fowler showman's, an Aveling Porter roller-cum-traction engine, and a Foden compound. The Fowler, No. 15121, is named *Royal Jubilee.* It is in working order, but its generator and crane have been removed, so that it can be used for threshing.

The Aveling Porter is permanently a traction engine, and it has rubber tyres, like the Fowler and the Burrell and Ruston Proctor. It is freshly painted and in very good order. The Foden is a large general-purpose 8 h.p. compound. It is not in working order.

Sandbach. At a nursery up Smithfield Lane, stands Marshall No. 73403. The steering gear, motion lever, pump, brakes and inspection platform are removed, and the boiler only is used, to supply steam to nearby buildings. The engine, a 6 h.p. compound, is not allowed to turn over. The boiler is fed through the injector. The engine is 61 years' old. The blower is kept going for draught for the fire.

Smallwood. By the road stands a Foster steam tractor, with a wood-rimmed flywheel. It is not in working order, but is complete.

Yours faithfully,

Sandbach. A. BAILEY.

Re "My Enlarger"

DEAR SIR,—It is not at all obvious to me why Mr. Cookson uses a train of three gears; surely the rate of movement of the enlarger head is governed by the size of the pinion to which the four-ball handle is secured, the intermediate pinions affecting the direction but not the rate of movement. It would seem equally satisfactory to arrange for the pinion meshing with the rack to be directly operated by the handle. On page 88 ("M.E.," January 18th) is a reference to a 6 : 1 ratio; as I read the drawing, this is the ratio of the gearwheel sizes but no mechanical advantage is obtained by the arrangement.

If the drawings have been misread, perhaps Mr. Cookson could explain them further in THE MODEL ENGINEER.

Yours faithfully,

Bexley. T. BROMLEY.

DEAR SIR,—First, allow me to thank your correspondent for his frank criticism of my enlarger design.

I incorporated the train of gears for one simple reason—to bring the operating four-ball handle nearer to the front of the instrument and away from the counterbalance weights.

No mechanical advantage was desired, since the weight of the drive is balanced. One small point; if the cable breaks securing the balance weights the fact that the gears have then to be driven in reverse tends to prevent a sudden drop of the slide down the column. Since the enlarger was photographed I have added a guard over the gears—very necessary.

Yours faithfully,

Preston. R. M. COOKSON.

Camera Construction

DEAR SIR,—I read the article by John H. Russell, describing his 35 mm. camera, with the greatest interest, and determined to make one to the specification given, until I got around to the question of the lens. The current issue of a well-known photographic magazine did not produce one single offer of a lens of a large aperture *in a shutter.* There were hundreds of f2 and 2.5 lenses, but none with shutters.

Perusing about fifty back numbers of the photographic magazine, I found only one which contained such an offer, this time of a 4.5 lens. The big snag then, about Mr. Russell's camera, is that unless one possesses the necessary lens and shutter already, it will almost certainly be essential to buy one new, or obtain one expensively anyway.

The idea of a home-made 35 mm. camera, however, is such a good one, and I believe, of great interest to a large number of your readers, that I would like to suggest that perhaps one of your contributors might be able to design a simple focal-plane shutter for this camera, preferably of the rubberised fabric type fitted to the Leica, and incidentally, working horizontally as in the latter camera. With such a shutter the camera would have a wide appeal, as there are hundreds of suitable miniature camera lenses available on the second-hand market, although all without shutters.

Yours faithfully,

Eastbourne. G. H. GUNTER.

Compressors for Refrigerators

DEAR SIR,—Referring to Mr. Connell's letter regarding the use of a Heywood compressor, I should like to pass on to him some information I obtained on this question.

Apparently aluminium cannot be used in any refrigeration equipment that uses any of the Freon series of refrigerants, owing to the fact that the aluminium will completely disintegrate in the matter of a few hours. A close friend of mine found this out by bitter experience, the pumps of a large refrigeration plant which he had recently installed having completely failed after only a few hours' operation.

I might add that this same person told me how much difficulty he had to obtain cast-iron of sufficient density to retain Freon; he found that the molecules of the refrigerant are small enough to pass through the pores of the metal at a sufficient rate to appreciably reduce the pressure of the system. Even Meehanite was not very much better for this purpose.

Yours faithfully,

Port Hope, Ontario. ARTHUR D. DUNN.